CREATIVE DEVELOPMENT IN THE CHILD
THE MONTESSORI APPROACH

VOLUME II

Edited by
RUKMINI RAMACHANDRAN

KALAKSHETRA PRESS
THIRUVANMIYUR, MADRAS-41, INDIA

First Published 1998

Printed in India at
Kalakshetra Press
Thiruvanmiyur, Madras-41

" We began by protecting the child and now we realise that it is we who need protecting. We began with methods of education and culture for the child, and we end by acknowledging that he is our teacher. Not a teacher who gives us culture, but one who can reveal to us as no other our own Nature and its possibilities. Therefore we are drawn towards him as individuals, as members of society, and for the good of the human race as a whole."

Dr. Maria Montessori

CONTENTS

Pages

CHAPTER I

The child between the age of three and six years has characteristics, which are so special that they can be placed in a special psychological group. A special plan of education must be formed to correspond to this psychology.

Once in a garden attached to one of our schools, we had a little baby goat. Everyday, I gathered certain leaves that this goat liked, and fed the animal, keeping the leaves low at such a height that the goat stood up on its hind legs, with the front legs folded up in order to nibble at the leaves. As I served this little animal leaves everyday, I believed that I loved the goat dearly. One day, a child who was watching me feed the goat, approached the animal, and linked his arms under the body of the goat to support its weight. The little face of the child was very serious as though he was carrying out the task of helping a needy human being. So we might say, this child had a higher form of love for the animal, and a higher sense of justice. He was trying to keep the little animal from doing the unnecessary work I was forcing it to do.

Worms inspire a certain kind of loathing in most adult people, who do not like to touch them. Children do not share this repulsion. We often see a child carrying around a worm, holding it without any horror or fear. Often we can see a child in contemplation in front of a flower. We can find a ring of children around a plant on which a rose has bloomed during the night. We can see the great care that the child takes in watering the plants in the garden. Thus it is sufficient to put a normalised child in contact with nature. It is not necessary for an adult to teach the child respect for life, because an adult is less sensitive to these life forms and less respectful of them than the children are.

If there is in the world a child who is cruel to animals, who persecutes or kills them, or a child who breaks up flowers, he is a victim of an error in treatment. There are certain actions which are the result of an inner disorder, of an inner trouble. When these disorders have been eliminated, and when that which was lacking has been replaced, and when that which was wrong has been corrected, we see these difficulties disappear. There may be a certain child who for a special cause retains these difficulties, but in general, when the child is captured by objects which fix his attention, and becomes normalised, he develops and expresses the high and noble sentiments which we like to see.

We cannot be teachers of love. However there is something we can do to help the child to develop these sentiments. We can offer him a deeper knowledge. The deeper the child's knowledge of an object, the greater his respect for the object grows. He then wishes to keep safe the object he knows so well.

When the child has been initiated into the use of material and becomes accustomed to it, he is given the freedom of choice. He can use it any time he pleases. This free choice, is one of the fundamental bases for achieving calm in the child's soul. It is of great importance because it requires initiative on the part of the child. If the child uses the material because the teacher commands him to do so, the child is not free. If he has the freedom to choose he is really independent, as he depends on his own will and not on that of another. Offering the child free choice is one of the ways of organising and developing his personality. The child can choose only those objects which he knows how to use. Once the material has been presented, and the child initiated, he can use it as long as he wants.

When we have a group of children, each of them free to choose any material, and only one set of material for each exercise, we find ourselves faced with the fact that the free choice is limited. If one child is using one set of materials, another child who wishes to work with the same object must have patience to wait for it. This the child understands, for there is a rule that the material must be taken from its place, and not from another child. So he must wait until the material has been put back in its usual place. If he does not want to wait, he must choose something else. Often we find that a child will choose some other material, not just the special thing he wished to work with. Thus because there is a free choice, the child develops as a social being. One of the most important factors in this period of development between three and six years, is that of social experience. In the environment, there are possibilities and limitations through which the child acquires a special attitude towards these continually repeated experiences. We must reflect on the fact that the way to the highest form of social adaptation is prepared gradually by simple social experiences.

The child needs to move, and control his movements in order to work with these materials. He gradually masters the movements, and becomes a balanced individual. In order to acquire this balance, the will and refined movements must grow side by side. The balance must be a gradual conquest, a conquest achieved by exercise. For instance, the marvellous Indian dancers[1] who move their arms in an

---

1. At this time Dr. Montessori was closely associated with *Kalakshetra* a college of Indian fine arts founded in 1936, and its founder Rukmini Devi Arundale, a multi-faceted personality, herself a dancer and an educationist.

extraordinary way, are masters of their movements. The capacity to move in this special manner requires previous exercise. These exercises put a great number of muscles into relation with the will. When we make a quick movement, it is not the quickness which puts the muscles into play. In fact many muscles are not in play at all. Let us picture in our mind, the will of man which gradually becomes master of his movements. Let us also picture all the movements that the child carries out in the prepared environment — for instance, walking on the line, carrying a glass of water without spilling, moving about the room without overturning the materials. These show that we are capable of obeying ourselves, but we are not all capable of obeying our own will. We would like to do so many things which we are not able to do. I would like to play the Indian drum[1] which requires quickness of fingers. My wanting to do so, does not enable me to do it. I would like to be able to walk in a room crowded with objects without bumping into things but with all my good will I cannot do it. I always bump into something. If I see a person who walks with a majestic gait, I want to walk like him too, but I cannot. It is thus not sufficient to have a will which commands — we must also be prepared to obey.

Although we can manage quite well *not* to do something, we cannot *do* everything in the world. In order to do something, we must be *able* to do it. When we want to do someting, but cannot, we become angry, irritable, and experience inner agitation. When we have the capacity to do things, we feel an inner calm. If we cannot do something ourselves and need somebody else to do it for us we experience a set of emotions — anger, impatience, rebellion — which are connected with the incapacity of doing,

---

1. A barrel shaped percussion instrument of South India called a *mridangam*, made of wood and cowhide, and tightened by thongs. It is essentially played to accompany South Indian classical music and dance.

which arise when there is impotence. These disappear when an action chosen by our own will is carried out joyfully and calmly, to the very end. It builds up our joy of life, and also the greatly admired virtue of constancy. It brings joy, calm, and patience. It builds the personality of the child, because through the exercise, the child becomes capable of planning and carrying out his own actions. When the child is able to do something, when he becomes master of his own movements, he is considered fit to live in society.

Generally the child is disobedient when he is told to do something. Yet we have seen time and again that a child who is a master of his own action, who can control his own movements, suddenly becomes very obedient to the commands of the teacher. This is really a logical fact. It is a natural law that we should obey the command of our own will. To obey the will of another individual is difficult, because the will belongs to one individual and the movements to another. Thus there is no nerve channel which places the will in relation with the organs of movement. Therefore, for the child to obey the will of another there must be a psychic link between the two. Even if there is a psychic connection, if the command requires the child to have mastery over his movements, and he has not become master of them, he cannot obey. Therefore, obedience is a superior characteristic which requires previous preparation. The work carried out by the child's free choice, is a part of preparation which lifts him to a higher level, where he becomes able to obey a will which is not his own.

We have studied these facts and identified three degrees of obedience. The first degree of obedience is the one in which the child sometimes obeys and sometimes does not. In the second degree, the child always obeys. There is the third degree in which the child seems to be anxious to be able to obey. In this stage he is full of pride, and the satisfaction of being able to say — " Ask me to do something !

I can certainly do it ! " In this stage, we see in the child, an enthusiasm, a desire to obey with exactness, and the joy of being able to carry out exactly in every detail someting which he has been asked to do. Thus it is a cycle of activity with its degrees and its progressive actions.

CHAPTER 2

Certain things may seem contradictory to us when we hear them without any explanations. The impressions received by the brain, from different sources, are really confirmations of the same fact. As all the impressions received by the brain are isolated, we have to analyse the impressions which appear to be contradictions.

If a foreigner came here to India, and was told something in Tamil, he would not understand a word of it. If somebody else then told him the same thing in Urdu, and in Gujarati he would still understand nothing at all. If a time came when he began to understand a tiny little bit of Tamil, Urudu and Gujarati, and the three people once again told him the same thing in their own different languages, he would begin to follow. He would get just enough to try to catch the meaning and follow it. In the third stage he would understand the languages so perfectly well that if he heard someone speak in any language, he would understand what they were going to say as soon as he heard the first two words. If we hear a piece of news from one person and a second person comes and tells us the same news, when a third person tells us this news, we know what he is going to say very well.

The same thing happens with these sensations that the intelligence receives. The intelligence is not consciously organised. Its organisation is directly related to experience. Nothing is wasted by our intelligence. When we do things, we have an experience. This experience is related to other experiences. We are conscious, of just a very few things that are on the surface of our mind, of only a part of it. The intelligence is a store of experiences, images and impressions. For instance, we may have had a grandfather who had lived in Bombay a long time ago. Yet our memory, on hearing the name Bombay, touches something at the bottom of our mind. The mention of a name, or the sight or sound of something may bring out an experience that we have had, transfering it from the subconscious to the conscious. Thus the impressions that we receive are stored in what we call our subconscious mind, and our intelligence becomes organised by recalling and formulating acute ideas based on these experiences.

The child's intelligence works in all directions. He is always enthusiastic and active in all things. This enthusiasm is the life of the intellect. Without enthusiasm, there is no intellect.

Adults are intelligent only in the area within their experience, and the things which arouse their enthusiasm in daily life. For instance, it will be much more interesting for a teacher to talk about education, than to talk about engineering. Even if the conversation revolves around the simplest thing in engineering, the teacher will not understand. As her intelligence has not been organised in that direction, the teacher will look stupid. In order to become intelligent in mathematics or engineering we must have experiences in those subjects. Otherwise those who have had mathematical or engineering experience will wonder how we could be so stupid. The human intelligence is very slow to arrive at abstraction. It is the most difficult thing to achieve in a new field. Problems in mathematics are very, very difficult for those who have not had suitable experiences as a child. Once the individual has arrived at the point where he can make abstractions, he does not look stupid any more. As abstractions become easier, the person becomes more intelligent.

When he is in the period before the sensorial age, the child receives certain impressions. They are all confused. In order that his intelligence may become organised, we have to analyse all the different impressions and give them a form, so that the child may absorb them, so that he may be perfectly conscious of the things presented to him. This analysis is necessary only as long as the intelligence is not organised. After the intelligence has organised the senorial impressions, there is no necessity to isolate this or that, because the construction of the intelligence necessary for education has already been achieved by the child.

The secret of life is to keep ourselves alive. This may seem funny, but it is not funny at all. If we are not alive, we are dead. It is the same with the intelligence. The secret of keeping the life of the spirit lies in the upkeep of the child's enthusiasm and interest. His interest may be destroyed in two ways — in finding things too difficult or too easy. Both are deadly for the life of the soul, for the life of the intellect. If the child's intellect is not kept at the highest pitch of interest, it will find a means to keep itself busy. The intellect can never stay still. No human individual can remain paralysed. If the child is not interested, his body is present but his spirit is absent. His mind escapes to something which is of more interest to his brain. If we can not keep his interest, the child will escape into a world of the imagination. He will think about horses, kings, queens, boats, aeroplanes and other things which are more interesting and pleasing to his spirit at that moment.

The great secret of life is to keep alive. This is not as easy as it sounds. If we want to keep the life of the child alive with the reality belonging to the phase of the life that he is in, we must know the psychology of the child. We must know the minutest detail of what is necessary to help the child grow not only in one direction, but completely. Perhaps it is only those who have kept the love of God alive in their souls who can feel the wishes and emotions of other people in the minutest detail. When we have a great affection for somebody, we feel we can satisfy the wishes of our loved one before they are expressed, as we have the sensorial sensibility which other people have not yet formulated. We feel every little vibration of that other life, even before our love goes out and feels that vibration consciously. Love gives us a deep knowledge of the people we love, and a close spiritual relationship with them. Only the love of God can give us this sensitivity. A mother understands and feeds her child especially when he is small. Although the child cannot express his wish, his mother understands him perfectly well. How can this be? If we give a baby of three months to a big strong, man, he will look at the child as if he is a lion. He will not know what to do with the baby. How is it the mother understands the baby so well? The tie of love, gives the mother the capacity of understanding the meaning of her child's language, not only the sense of the words, but also by empathising with her beloved child's needs. The feeling of the joy she experiences by fulfilling these needs is much greater than even the joy of a person who has his wish fulfilled.

To keep a person alive, we have to understand him through this great love. Intellectually, adults reason that if we understand a thing in a certain fashion, the child also understands the thing in the same fashion, because the child is a human being just as we are. In this logic, there is no love. Logic is frozen. In love there must be no logic. We may think that someone is stupid, that someone is indifferent and yet we may love him. If the person who is loved feels our love for him, he becomes alive. Logic makes us judge other people by our own standards. We set ourselves up as the standard. This is logic and not love, and with logic we kill.

It was discovered that a great number of deaths of infants was due to the fault of mothers who fed their children irregularly. Some mothers did not wash their child because they did not think it necessary. They did not know that their child could develop illness if not washed properly. It is logical to think — "I was treated like that, yet here I am strong! Why not my child?" The father also thinks — "If we are alive, the children should also be alive. If the children are not alive, it is because God took them away." An old mother may say to a young mother — "Do what I tell you, I have nine children, I know all about it!" Seven of her children may be dead! The young mother must be careful that she does not kill her own child. It is due to cold logic, that these customs of olden times have crept into the customs of the present day. Logic does not go with reality. Logic for one person may be death for another person. This is true in the spiritual sense as well.

The child explores the world through his senses. Through the Exercises of Practical Life which have a useful aim, and the sensorial activities, he becomes master of his own movements, his own intellect, and his own senses. His intelligence is so well trained that the slightest difference in shade, or sound in all tiny detail, is registered at once in his mind. The child can even walk on a line holding a glass filled to the brim with water, so steadily that not a drop of water is spilled. A child brought to such a point of perfection is perfectly organised. If we leave him at this point, his spiritual life and his intellectual life will die.

We have to help the child realise his conquests. We have to help him organise his intellect further and further into abstraction. A child of twelve years has moved into another field of exploration. We have now to give him material which enables him to visualise, and gives work to his mind.

Indians believe that the spiritual life is an abstract life.

What could be more abstract than religion, after all. Apparently, nothing. Religion is the communication between our own soul, which is the abstract part of our life, and God the most abstract part of creation. Yet to keep our religion alive, and to fulfil our communication with our God, we use materials. Thus the Hindus have a temple, which is a principal part of their religion. It is decorated with carvings, and little works of sculpture. Hindus hear the stories of their religion all their lives. They take their places in the temple everyday to look upon their religious figures and altars. They sing the same little songs that their forefathers sang, repeating their prayers in the same words, with the same exactness. If a little bit is changed they protest. In some of the Hindu ceremonies certain flowers are offered, and a special water is brought around. If religion is an abstraction, where is the need for statues in the temples? Although the human mind is capable of the highest abstractions, it needs something material to keep it alive, just as our soul needs a body to live in the world.

Every abstraction needs material to begin with, material around which it may be centred. The intelligence becomes acute only in that field, in which it has access to material. Thus material is necessary for the life of the intelligence, for the development of the intelligence. Once the intelligence has acquired a certain maturity, it no longer requires that material, but requires different material in order to go forward.

We have to offer the child another field of exploration — something even more abstract, which we do not see even in nature. This new field comprises of the abstract thoughts of man. We must offer the child, the opportunity of exploring thought, by materialising it. Just as the child organised and visualised shapes and colours, just as he isolated the impressions of the senses, so must he now isolate and materialise the sounds which will allow him to explore the world of the abstract thoughts of man, thoughts and words, created in the brains of men who have perhaps been dead for over a thousand years. Nobody knows any more what they looked like. Yet their thoughts are spoken of as though they were spoken today.

One of the greatest gifts that we can give the child, if we know how to give it, with the importance and simplicity it deserves, are the letters of the alphabet. There is nothing more simple than the alphabet, yet no other invention has been more miraculous. These letters not only allow us to make all the words that we can possibly think of, but also to understand any word that has been written in our language for hundreds of years. When these letters are offered to a tiny child, he must realise the importance of this science. Erroneous treatment will create a barrier in the soul of the child which will make him hate that which ought to give him the greatest joy. Indeed there is no greater joy than being able to have an understanding of the thoughts of great men. People can look at each other, understand each other without speaking any words. However, when we pick up a book, we hear a voice which is far away, of a person perhaps dead long ago. There is no one between us and his thoughts — thoughts which come to us without even a whisper of a sound. We can hear a person, who speaks in America over the wireless today. He does not have to lift his voice in order that we may hear. By reading however, we can hear the voice of a man who lived a thousand years ago, and understand what he says. It is really the invention of the alphabet which makes this miracle possible. The greatness of man can be offered to the child through the alphabet.

We can help the child appreciate and recognise this, if we offer him the letters in the simplicity of their formation, in the simplicity of their function. The child understands the function better than the mechanism. He will acquire the mechanism by his own repetition of the exercise. The alphabet must not be offered to the child as a means of writing. It must be offered to him as a means of exploring his own words.

We must first realise that when the young child goes to school, he already knows his language. We do not have to teach it. He speaks it, he has been using it for a long time. The little child never mistakes the singular for the plural. He does not make grammatical mistakes. He speaks correctly, and he speaks a great deal. The biggest mistake that a teacher makes is in treating the child as though he does not know the language. In front of her eyes, she has proof, that the child can speak his language. His brain is filled with it, he understands even the shades of the meaning of the words. Yet we start teaching him as if he does not understand anything, as if he is a complete blank. This kills the interest of the child. What is too easy for him kills his interest, just as surely as what is too difficult. He needs to be a master of what he already possesses. He is already a master in the practice of his senses, and move ments. He needs to study language in the same fashion, accompanied by all the vitality of a sensorial experience.

We can give the child a letter, which is the symbol used to represent a certain sound in his language, in such a fashion that his hand follows the letter in the way of the writing of the country in which he lives. A child between three and a half and four years, still has very active muscular sensitivity. Therefore touching a letter[1] and following its shape is still very attractive to him. We must also understand the importance of all the previous exercises like touching the contours of the geometrical figures. When we give to the child the letter to touch, we also give him the sound of the letter, but not the name. We cannot help the child to explore his

1. Today we refer to following a contour of a geometric shape or a sandpaper letter with the fingertips as *tracing*.

language, with the name. If we give the exact, phonetic sound of the letter, the sound we use in making up words, we allow the child scope for exploration. If we offer the child a word in which the sound occurs, we are offering his mind a new key. He looks for the sound, in all the possible words he knows. We often see the child mumbling a word in order to isolate one sound from the other sounds which form this word.

In the beginning we always give the vowels, giving the sound, and one or two words in which these sounds are used. We do not teach the letters as a means of writing, we only offer the symbols as a means to help the child explore and analyse his own language. In order to be able to write, the child has to be able to spell. How can we expect the child to spell just because he knows the alphabet? Memory is not the life of the intellect — it is a store.

So once the child knows a few letters, he begins to analyse his language. We may see a child all alone with an expression of concentration on his face. If we go near him, we will hear sounds. He may ask us — "What is the sound that corresponds to this letter of the alphabet?" Thus the letters serve to arouse the interest of the child. We can also offer the other letters in the same way.

This exploration and analysis of words must go on for at least six months. The child takes about that long to become perfect, if offered the letters at the right age between three and a half and four. After six months of analysis a strange thing happens. The child starts to enter into the activity. He wants to express words in the symbols he has learned through sounds.

When the child comes to this stage, his intelligence is ready to understand representation of sounds by certain symbols. Yet he finds that his hand is not ready to obey his mind. This difficulty is interesting. We must understand in this case that writing by hand would be a break to the expression of the child's intelligence. The child would have to wait until his hand could move just as fast as his intelligence. He would not be able to express himself because his hand would not be ready to write. If his hand is forced to laboriously form the letters, his poor intelligence would have to cope with the hand. Therefore, it is not wise to give the child a means of expressing his intelligence, which will be kept back by a mechanism which would take another three or four months to acquire.

To help the child overcome this problem, we offer him what we call the Movable Alphabet, which consists of all the letters of the alphabet — the vowels in blue, and the consonants in red[1]. If the child can analyse a word into its component sounds in his brain and knows the form of the symbol and its sound, we may notice him mumbling the words that he knows very well, and sounding them out. He may also spell the names of the objects around him, according to the sounds in the word. For instance if there is a vase before him, the child analyses the word and spells the name, taking all the letters representing the sounds in that word in succession.

The peculiarities of the construction of this word while writing is a separate issue. Certain groups of words are written in a particular way but pronounced in a special way. The teacher is apt to kill the interest of the child if he begins to correct the spelling. We cannot interest a man who does not know how to walk in making a high jump. Why should we want him to break his neck making a jump when he cannot walk at all? How can a child who is four years old, be interested in a word which is spelt *t-r-o-u-g-h* and pronounced *truf*. This becomes a barrier, and the child's interest in the analysis of words disappears. When his intelligence is ready, and can cope with it, the child will become interested in these peculiarities. However at this

1. Today the vowels are blue, and the consonants, pink.

stage, we are not offering the child the spelling of words, we are giving him the means of exploring an intellectual activity.

The letters we offer the child are cut out of sandpaper and glued onto a background of smooth paper. The vowels which are the main part of the word, are presented first and then the consonants. Literally the word consonant means sounded with a vowel. So the consonants are offered later. The child is shown how to touch the letter in the same direction as in writing. The sound of the letter is also given. The sensorially organised intelligence receives three impressions — those of touch, sight and hearing. The child receives the impression of touch because the letter is made of sandpaper. He receives an impression of sight when he sees the shape of the letter. He receives an impression of hearing, when we make the sound of the letter. Each impression serves to strengthen the other.

These letters are presented to the child in three periods. In the first period the letters are presented. The second period is the period of recognition. The teacher asks the child to show a particular symbol, and the child has to recognise the letter by the sound pronounced by the teacher. The second period lasts longer than the other periods, because the sound has to remain impressed on the mind of the child together with the visual form. In the third period on being presented with the symbol, the child pronounces the sound.

The child must touch the letters presented correctly, following the shape of the letter in the exact way in which it is written. The child who cannot follow the letter correctly must persist until he knows how to do it. This is very important. In many of our schools, I have seen children who have taken in the visual impression of the letters, try to reproduce the symbols anyhow, as they do not know how to touch the letters the right way.

We can help the child by collecting a number of objects or pictures of objects, and placing them in the environment of the child, so that he can form each of these words with the Movable Alphabet without going hunting for words. The words sugested by the objects or pictures must be those which can be written as they are pronounced, thus having phonetic spelling. The objects must also be those which the child already knows — for instance, objects found in the kitchen, leaves, plants, animals, all kinds of objects familiar to a child of three years.

We must never ask the child to read what he has written with the Movable Alphabet. It is not the calligraphy that he cannot read, but the sense of the words. The child forms the words according to their sounds, not according to their meaning. When the child forms words by himself, and when he forms words dictated by others, the words represent two different mental attitudes. In the first case, he starts from the word which he already possesses, synthesising all the isolated sounds which he throws out to express a word which his brain understands. When we ask the child to write, he does not start from the spelling, he translates the word into symbols. He writes the word by its sounds. The abstraction which is the word, does not come to his mind at all. If we ask the child to make these different symbols into sounds, they would not be words to him, they would just be isolated sounds. Six months will pass before he starts writing, and another six months before he becomes interested in reading. The mind of the child must acquire greater maturity before he begins to read. Who would imagine that the child who can write does not know how to read? Yet experience has shown it to be true.

After just a few sandpaper letters have been presented, we can present the Movable Alphabet to the child. We must not wait until we have presented all the letters, but offer a few well chosen words and the Movable Alphabet.

We must never allow the child to form words with the sandpaper letters, because doing so will bring confusion and chaos into the mind of the child. Another thing which we must remember when we prepare the sandpaper letters, is to use contrasting colours to impress the form of the letters on the child's visual sense. The letter must therefore be in a brilliant colour, and stand out clearly.

The letters must always be presented in pairs. We start with two, but we do not put the first two away when we go on to the third. By constantly adding to the letters that the child already knows, we confirm the knowledge of the child. Gradually we present all the letters of the alphabet and ask the child to pick a particular one from among them. Only when the child starts to read well, do we give him the name of the letter. Knowing the name of the letter first will only cause him displeasure. It will not arouse his enthusiasm. He can learn the names of the letters at any time. To learn them is easy. The mental mechanism and the habits derived from this method lasts him the rest of his life.

CHAPTER 3

In following the development of the child, we come to another field in the world of pure abstraction. Like the alphabet, this invention of man, is not found in nature, but has been thought out, and agreed upon. Numbers are the conventional symbols used by a group of men in order to indicate quantities, in which the symbols have certain names. They have no value by themselves. What gives the symbols and their names value? A flower may have a form, a colour and a scent, but a number has a value only because a group of men have agreed to fix that value to a special symbol. If I fix to the symbol 1, the value of hundred and you fix the value of one to it, we shall not understand each other. The numbers, like the alphabet, have been a means of exchanging ideas between men, a means of understanding one another.

We believe that coming to this understanding, presents a great difficulty for the child. That is not so. We must remember that the child is the beginning of man. He is a creation of God and he has within him all the human laws, all the human characteristics. He has the potential, therefore the faculties can easily be acquired. Every human child when he is born, if he lives, is going to become an adult human being. This sounds logical. Therefore it is also logical that the child has in him all the human attributes of the adult. There is no adult who does not have the power of making an abstraction. Without the power of abstraction, he would only be an animal. It is this power which gives him the superiority that he enjoys. This power does not come to the human being suddenly, when he has reached the age of twenty or twenty-five, when he has come of age. This power is within the child when he is born. In following the child, we have seen that the child of six months is capable of making abstractions. Why then should a child find it difficult to make abstractions? We might as well say that the child finds it difficult to grow physically!

In the middle ages, there were in our country, jesters who appeared funny to people, either by their ways or by their appearance. In order to make them appear funny, these jesters, as children, were put in certain casts which did not allow their bodies to grow straight. Their bodies were crooked, and the growth was restrained, and painful. What education has done, is to create conditions similar to the casts used in the middle ages to shape the bodies of human beings, to shape the mentality of human beings who come into the school. Without such restraints, growth is not painful, but pleasant and obedient to the laws of God. When we do not go against the laws of God, but follow them, we find joy, peace, calm and rest.

To enter society, the child has to acquire certain qualities. We wish to shape him to this end. If he rebels, we force him. The reason we argue is because one day he will have to go into the world. Where is the child if not in the world? Is he in the sun, or the moon? Indeed he is in the world, and must acquire the responsibility of being in the world. What does this responsibility entail? Does it mean that the child is going to make a certain amount of money which is difficult to get?

The child's main responsibility is to create a man, and he will create a man whether or not we want him to. He may create a good man or a bad man, who has either to grow or to die.

In this world of abstraction, it is as natural for the child to grow intellectually as it is for him to grow physically. He will find as much joy in the acquisition of mental growth, as in healthy development in the physical field. However we have to offer him the opportunity to grow normally. We cannot set a programme for his mental growth, based on our own political needs, or educational ideas. If we do that, we make a painful cast for the child. We judge children from our own adult point of view, from the level of thinking and reasoning, which we have reached. On this we base our judgement of what the child should do.

There is nothing easier than to do things that we know how to do. It seems so simple. Yet if I knew how to swim and I explained very carefully to an intelligent person who does not know how to swim how he should do it, with all his intelligence, he would sink if he tried to swim!

To go from nothing to something, is creation. To create, is the most difficult thing in the world. To grow afterwards is easy. The first step, the beginning, which leads from nothing to something, is most difficult. In the abstract world, the growth from materialisation to abstraction is a difficult new path into new fields, new abstractions. The child's progress is very, very gradual until he has acquired a certain level. After this level is reached, everything becomes very easy.

In the field of language we must not teach the child words which he already knows as something new. He has spoken the language and used the words in it for years. In the field of mathematics however, the child does not know anything. He may have distinguished a group of words which refer to quantity, but has no previous experience with numbers. He does not know the system which organises them. He has to understand the whole construction of numbers, counting from zero to ten. The introduction to numbers cannot be treated in the same manner as the introduction and analysis of language. Every step taken must be taken with a care not required in other fields, because it is entirely unknown.

The seed of mathematics must hence be very, very carefully sown. We must not confuse the trunk of the tree with the branches. We must certainly not expect good branches to grow on a dead tree. Many people reduce mathematics to certain feats of memory. If we make the child learn that three and three make six or two times four make eight, we are constructing a tree, by nailing small dead pieces of wood to a larger piece of dead wood so that it resembles the trunk of a tree with branches attached. In doing so, we have only created an illusion. It is no tree, only a cross. It will bear no fruit. It will give no life or joy, only suffering. Instead if we plant the seed carefully, we can watch the little plant take firm root, sprout leaves, and grow strong branches with pleasure.

Thus we must watch the intelligence. Once it has grasped facts, once it is mature, and can be brought to the abstract level of the mind, we can add something more. When the child works with the material, he grasps abstract facts by the repetition of the exercises. Then he is ready for the next step. We can gradually move from material facts to still higher abstractions through easy steps. In the traditional schools, the teacher starts from the most elementary level. She writes the numbers on the blackboard and says the names. She expects the child to understand. If the child does not understand, the teacher uses some objects to help him. She shows an object, a seed perhaps, and says — "One!" She adds another object and says — "Two!" She adds yet another, and says — "Three!" She takes one object away and says — "Two!" It is very simple, and very logical, but very confusing to the child. A deficient child, who could not register experiences, or receive impressions as we do, and who has not arrived at numerical abstractions, would not understand how the first seed named one becomes two by the addition of another seed. The name seed apparently becomes one. This change of name of the object itself causes confusion. The number two is to him one, and another one. The child who is still in the period of construction of the mind in which all is in order, who labels everything around him, becomes confused, and cannot arrive at this abstraction. He can not arrive at the conclusion that an object to which an object is added becomes another. Thus presented with the second object he says — " One, one ! " He does not say — " One, two ! "

The child must have great maturity of mind to arrive at this. To one who knows how to swim, the act of swimming is very easy and very simple, but until he has learnt to swim, it is difficult. To arrive at the abstraction of numbers, to create something from nothing is a very difficult step for the child to take. So if we want to present quantities to the child, each quantity must be presented in one piece, and each number, treated as a separate object, not as one object added to another one. The objects that are usually prese-sented are each of the same value. Instead different objects must have different values. So we must take objects which cannot be broken into smaller units so that we can show that there is a distinct difference in value between the first two numbers which are at the same time separate objects. We can then name each object.

To present numbers, we use the Long Stairs of the sensorial exercises, so that the child is already prepared to use the material. The lengths are so displayed that the first rod serves as the unit of measure. The relative differences in quantity has already been impressed upon the sensorial store of the child. He is thus able to judge the difference in quantity. The first rod is one, and then the second which is a different object is two. It is separate from one, yet has the value of two. The first object does not disappear into the second. Each rod is a whole quantity in itself. The child sees the sequence and how it is formed. He sees that the name and quantity are related. He thus builds the natural sequence of numbers sensorially as the rods when arranged in order of length, contain the sequence of numbers.

We use a set of exercises to help the child become familiar with the numbers — the names and the quantities. First we present the quantity represented by each rod by means of the three period lesson. Then we have a set of games. We can name one quantity and ask the child for a rod immediately higher or immediately lower to it. Every time we must ask the child to count from the beginning, (from one) so that gradually the names of the rods are fixed in his mind, so that he does not have to count any more. The mind of the child matures through observation and gradually he understands that the quantity two, is equal to two ones, a logical step taken by the mind. Thus the clarity of each group of quantities, and the value of each group is recognised.

In traditional schools, they start by giving the symbols. Then they give the names and the quantities in separate units. This presents a great difficulty to the child. In our schools, at this early stage, we present only quantities and the names of the quantities. We do not present the symbols of the numbers. The field of mathematics is entirely new to the child. Unlike language, in this field, the child's pleasure is derived from overcoming difficulties. If we present them one by one, the child will desire to go forward as it gives him the pleasure of growing mentally. In the field of language, the child already associates the sandpaper letter, the symbol, with its corresponding sound. Therefore the symbols representing quantity, the sandpaper figures, are presented to the child separately from the quantity.

The child touches the symbols of the numbers in the same way as the letters, and says the name of the corresponding quantity. It takes some time for the child to learn the symbols, to learn their form, and the direction of writing. He finds the same pleasure here as in the learning of the letters. Only after the child has learned all these does he spontaneously arrange the quantities and symbols together in succession. Sometimes the teacher may do it first, when she feels that the child is ready for this step. When the child starts with one, he is able to go on because he already possesses the knowledge of all the numbers, so he is able to put them in relation to each other. So we present these three steps to the child — the quantities without the symbols, the symbols without the quantities, and then the two together.

A point of importance which may seem strange is that we must always be careful, never to use the sandpaper figures to make the association between the quantity and the symbol. Instead we must make a separate set of symbols[1]. The child is constructing the mathematical mind, which is based upon order in everything. By now he has seen that each group has a certain value in relation to the first rod which he has taken as the unit of measure. He has also seen that the difference between one group of units and another is always the same. Each of them has a certain value in relation to the quantities. By making this compaparison, he gets a sensorial impression of subtraction and addition. He begins to understand the nature of the addition sum which is the union of two quantities, and also that in subtraction, from the big quantity we can take away a lower one.

Numbers can be presented to a child between the age of three and a half and four years. Once the basis is built,

---

1. The cards we use today to help the child make the association are white. On each card the Arabic numerals 1-10 are painted in black. The cards and the numerals are the same shape and size as the sandpaper figures.

how quickly the child goes on! If we offer the child these ideas according to his logic, and not according to the logic of the adult, the child learns in a few weeks, the work which may take him two or three years in a traditional school.

The natural sequence of the numbers is presented through the length of the rods. At first, the child is offered the names of the first ten numbers, the symbols representing these quantities, and the quantities corresponding to each symbol. He is offered ten numbers, because that forms the basis of the decimal system. The English people say that they do not use the decimal system[1]. They say that it is not necessary to teach it to their children. I have never seen an Englishman count using twenty or forty! He does count only tens. He does not notice, but he uses the decimal system in all things using tens, hundreds and thousands. When this basis is given to the child, he has the basis for the whole of mathematics.

Another material, consists of two boxes, each divided into five compartments. On the back wall of each of the compartments, one of the ten symbols which the child has learned is written. One box has 0 to 4, and the other box 5 to 9. With this material there are 45 spindles all alike. The child has to put into each compartment, the number of spindles (the units) corresponding to the symbols. A curious fact is that the child already knows that the units of each quantity are a group. However his abstraction has not yet reached the point of being able to see this when these units are loose. With the number rods, the units in each rod were combined. With the spindles, he needs to group the units together. The child at this stage wishes to do things correctly. Some children in fact, like a ribbon to actually tie the spindles together. Even the compartments are not sufficient for them to group the spindles to-

---

1. Today the English people do use the decimal system, as hundred pence make a pound.

gether. The child thinks — " How can they form a group if they are not united?" All quantities are abstractions. There is no material tie to form a quantity. The child does not arrive at this conventional way of grouping units together to make this abstraction until much later.

This is the second step towards abstraction, the second period of maturity of the mind. How slow it must be in order to bring about a mental growth! If we follow the natural psychological development of the child, we see that he may grow fast, but only as fast as nature allows him to grow. Can we make him a man in one day? We cannot! Indeed it is stupid to think of doing so! To achieve natural development, in the growth of his human body and in the growth of the intelligence in his little brain he cannot jump from one thing to another. He takes twenty-five years to grow into complete manhood!

After this second stage, there is the third step[1]. It is usually introduced when the child is quite mature and ready for further abstractions. We offer the child the same set of numbers which go from 1 to 9. The child places them in succession, one next to the other. For us it is the proof of the child's ability to abstract, to see if he has learned, or not learned, the sequence of numbers. With the number rods in the first instance, the Long Stairs offered guidance. In the second case, the symbols painted on the spindle boxes offered a guide. This activity however offers no guide. The child whose mind has built the sequence of the numbers must arrange them in succession. A series of small, unusual objects, absolutely identical in appearance and size (like shells, or ivory counters) are also provided. We do not use ordinary objects, as the child always likes

1. Before this third step there are two activities which Dr. Montessori thought essential. Today these are called the Zero Activity and the Memory Chit game. More information about these activities can be found in *The Discovery of the Child* (1948).

objects which are attractive and nice. The visibility and the attractiveness of the material helps the child in the exercise of abstraction. The objects are counted, and the quantities are placed beneath the symbol to which they correspond. The counted objects, when forming an even quantity are placed beneath the coresponding symbol in pairs one below the other. When counting odd quantities the single member of the last pair is kept to one side beneath the preceding pair (fig. 14) to draw attention to the fact

1	2	3	4	5	6	7	8	9	10
x	xx	xx	xx	xx	xx	xx	xx	xx	xx
		x	xx	xx	xx	xx	xx	xx	xx
				x	xx	xx	xx	xx	xx
						x	xx	xx	xx
								x	xx

(Fig. 1)

that when we divide odd numbers there are more pieces on one side than the other. The child thus begins to understand sensorially all that there is to know in mathematics.

The child at this point has absolutely everything that he needs for the understanding of mathematics. After all it is not possible to find a number which needs any other symbol than the ten we have taught him! With these ten symbols, he can understand any number. He has also seen the nature of addition, subtraction, multiplication and division, and observed the possibility of these operations, although he does not know their names. So the basis prepared, the child must analyse and study the details.

Thus while presenting things gradually, a view of the whole, an understanding of the whole, is then given to the child, who will then go into the details. Thus the branches of the tree are formed. We have only to put in the roots, the branches come out of their own accord.

CHAPTER 4

In our schools, the class is not a fact which has been provoked by an exterior agent, but an environment which is attuned to the nature of the child. When we put this into the practice, it is not as easy as it sounds.

Even with the great reforms in traditional schools today, from the point of view of the moral treatment of the child, the child is not allowed to act. There are schools in which the teacher uses sweetness and persuasion, instead of commands and threats. In order to forge a closer and intimate link between herself and the pupil, the teacher may say to the child — " If you want to please me, do not do this ! " Or she may say — " If you love me, please do this ! " We must realise that there is no substantial difference between a command and this persuasion, which is a sort of seduction. In both cases the child is forced to act according to the will of the teacher.

In another tactic, which some mothers use, the adult commands the child, but at the same time explains to him why he should obey. There is nothing more dangerous than making the child obey in this way. Persuasion is a reflex action of reason. The reasoning power in man develops very late, and reflex reasoning even later. To develop reason, it is better that the child is not under the influence of another individual's reason. If the mind is reasonable, it does not need another individual's reason to cause it to reason. It will reason by itself. When an adult makes the child obey by persuasion, or by command, or by any other means, it is always by substituting his own personality for that of the child. Persuasion, is thus like a cloud which hides the sun. With it comes a moral and intellectual softness in which the individual no longer exists as an individual. In fact, the least dangerous method of all for the personality of the child, is the violent command, as the two personalities, the one which gives the command and the one which receives it, remain distinct.

Work and free choice are closely related to the nature of the child. We must not confuse our method in which the actions of the child are allied to his true nature, with more modern methods, in which the way of making the child obey has changed in form, though not in substance. Our aim is to free the personality of the child, by his own action. A teacher once said to me — " I let the child choose what he wants ! " As I watched, she called a child and said — " You can choose what you want. Tell me now, what do you want ! " The poor child became confused. He stared, and took what came first within his reach. The consequence of such adult behaviour may be that the child does not show his own aptitudes. So the teacher when she observes the child must be able to recognise that the child may conceive his own idea and try to put it into practice. This is not very easy.

If a child takes an object and starts working, it is very important for the teacher to observe, if the action is carried out to its completion. A good teacher in this case is one who can forget that a certain level of pefection is required in the technique of carrying out an action, and also forget her need to help. A good teacher must simply act as though she was not there. It is not important that the child should perform the action well, but that the action has arisen within the child, that he has by his own initiative started to carry out the action. It is through the repetition of these initiatives, that the personality of the individual is built up.

Every spontaneous action of the child is like a little lamp lit in the dark, and every new little lamp helps dispel the darkness. If the child, puts some objects on the floor instead of on the table, he has taken an initiative to do so. The teacher only sees that the child has placed the objects in other than the usual place. If the teacher corrects the child at this time, the child will not repeat the exercise. The teacher acts as the extinguisher that puts out the flame; the little light disappears and there is only smoke instead.

The teacher wants the child to carry out all his actions with perfection. So when all of a sudden she notices that nothing is perfect around her, she becomes confused and agitated and is herself like a candle about to be put out. Some rules may therefore be of help both to the child and the teacher. When the child shows spontaneous initiative to perform an action no matter what error he makes, the teacher should not correct it. There will always be time for correction. Not one of us began with perfection. The teacher must sympathise with the errors of beginners, so that she may not become an extinguisher of spontaneous activity.

Not to interrupt spontaneous action does not mean, as many people think it does, that no correction should be made or that a child should grow in error. It only means that the formative action of the child should not be interrupted. In practice, it has been found that by correcting the child during spontaneous activity, he is kept back from taking in abstraction. The child, when he is corrected, does not do better, he instead stops all action! Of course correction can and must be given, but never during the activity. First the teacher must respect the cycle of the activity and observe the child at work. Afterwards, the errors observed, must be made the centre of a new lesson. Therefore to eliminate an error a lesson is given, not at the moment of activity, but later.

If a child approaches another child who is at work, should the teacher protect the child who works? This poses a problem in the teacher's mind. We must remember that the child comes to school not only to work with the material, but also to have social experiences. Amongst these social experiences is self-defence. To observe how one child defends himself from another child is interesting. We know that the energies of two children of the same age are more or less of the same intensity. When the teacher disturbs the child, it is like a big animal falling on top of the child. If a lion or a hippopotamus came near us, our nerves would not stand it! However if another child disturbs him he is just a comrade, a companion who comes around to help. If we were working, and a dog came near us, we would drive it away. Therefore if one child goes near another child to grab a pencil, we must wait and see how the child reacts to this interruption. A child who disturbs another child at work may be sent away at first, but may return persistently till the first one says — " All right, let us do it together ! " The two children may sit next to each other and start to work with the same material; a sort of association may arise between them while working together, helping each other to carry out an exercise. On the other hand the child who is working may not give in. In both cases there has been a social experience, an exerpience leading to social adaptation.

We must also consider that if we defend one child from the interruption of another, the child may carry on with his work. However his interest in the activity may have been so great that he would have returned to take up the work later on. In the meanwhile he would not have had the social experience also needed for his moral building. If the teacher constantly defended the child, he would never be able to defend himself. It is therefore important for the teacher to observe all that happens in this small world, where individual strengths are more or less equal. There is also another social experience which is important for the child. If a child is using a certain piece of material, and another child wants to use the same thing, he has to wait until the first child has finished. This experience of self-control, teaches him that each person in the world has his own place and that we must respect the places of others. It is impossible to learn this fact by hearing it as a moral principle. It must be developed through experience.

Thus there are two important principles involved — the development which the child attains through activity with a material, and the development of aptitudes through successive social experiences.

If the teacher can be wise and find a little bit of amusement in watching, many natural and interesting facts will unfold before her eyes. If instead of merely watching, the teacher takes things too seriously and finding the material which should be in one place in another, interrupts the action of the child, the development of the environment of the class can very seldom take its normal course.

An interesting exercise for a teacher who has an overpowering impulse to go and correct the child is to look at her watch and say — " I am going to wait two whole minutes before I go to correct the child ! " This will be of great help to the child, because generally within two minutes, the problem is solved by the child himself. This is however a very difficult exercise for the teacher.

In California, in order to persuade the teachers that their intervention was unnecessary, I suggested that they should tie themselves to their chairs or to a post. Each time they tried to get up, they would be pulled and thus reminded not to get up to correct the child. They told me afterwards that if it had not been for this ligament binding them down to their chairs, they would have interfered very often in things which found their own solution.

To another teacher I gave a string on which there were nine beads saying — " Before you interfere, pull all the nine beads off the string. In the few seconds needed to do this, nothing very dangerous can happen to the child. No lions or snakes will come, nor will there be a fire ! " The exercise helps the teacher control herself. It serves as an education of her will so that she becomes more conscious of it. To be a successful teacher benevolence and patience are pre-requisites. Development comes through exercise. For the child to attain development, he must carry out an activity.

The teacher must always be observant. She must have an eye on all the children in order to be of help to the child, to help him do his work by himself, alone. She must prepare everything for the child so that he can work without interference. She must present things in a clear fashion. She must give lessons which will correct the errors she has seen the child commit, but not on the same day. She must not do anything to stop the formative activity. She must not interfere when the interference is useless. Then it would be dangerous, because such interference would then be an interruption of creative activity. If the child is to develop normally, there should be the motives of interest and action in an environment in which social experiences can be had.

Once, I visited a school in a tenement house. The parents of the children in this school went to work, and abandoned them to play in the streets. The object of starting the tenement schools was to gather these children together. On the day of my visit, three of the children were absent from the school. They had gone into the streets to play. The teacher was frightened and said — " What am I going to do? They are absent ! " I said — " What can you do? You cannot go into the streets to bring them back ! Let us wait and see what happens." After two or three days, the three children came back to the school. The teacher asked them — " Where have you been these three days ? " The children admitted quite frankly that they had been playing in the streets. The teacher asked them — " Why did you come back ? " The children replied — " In the streets there is nothing to do, while in the school there is so much to do". So they had come back. If we had forced them to come back to the school, the children would always have had a desire for the streets. Now they had experienced the streets and had found nothing to do. They clearly understood the difference between the two, that one was better than the other.

The story of these children is an exaggerated example. We must remember that these children were in need of a moral education. What was the advantage to these children to have these schools which accepted them with benevolence? The environment was beautiful and full of interesting occupations. This was the fact which attracted them from the street. If our aim was to correct children who had been abandoned, who had developed criminal characteristics, the best way would not be to threaten or admonish but to create an environment which brought about the correction. Therefore it is important that an environment should have as many motives of activities as possible. These experiences help to develop the moral and mental aptitudes of the child. The interest of the child should be aroused towards activity. This interest should be left to itself to develop, to carry any action to perfection. Naturally there is a social intercourse which follows the social experiences. The correction and the perfection in the act are secondary and come through the experience. Correction and perfection do not come through words. We say — "Be good!" The child does not become good, if he has not understood what he should have. If we teach him how to add a detail to his work that will keep his interest in the activity alive, we can help him develop the normal functioning of his life which is growing.

CHAPTER 5

The development of order and discipline in our schools is linked with the very nature of the child. The child by nature is brought to work. He obeys the teacher spontaneously. This means that there are spontaneous tendencies in the child which urge him towards these goals. So, if we succeed in giving to the child true freedom, he begins to work. Through work he becomes disciplined.

In the school environment there is mental development through work. The child also has social experiences which are born from his relation with the environment. The mental development has three aspects — free choice of work, repetition of the exercise, and concentration. Social experience too encompasses three points of reference — self-control, self-defence, and association.

As a consequence of free choice very special social sentiments emerge. One of them is the help that the child renders to others. This help has special characteristics. One child helps another child only when there is real need for it if that child can solve the problem by himself. The child instinctively knows when help should be given and when it should not. A teacher often intervenes at the wrong time. For instance, a teacher who sees a child transporting a heavy table, tells a second child to go and help. The child, if left to himself would not have gone to help. In not going to do so, he would have done right because the child carrying the table was making the effort by himself.

Help, when it is unnecessary, becomes a social disturbance, and troubles the people to whom it is given. The child has this sensibility. Moreover, he is always ready to help when there is real need of help. If a child breaks something, all the children console him and help him. Also when there is something interesting for all the children to do, and they find that one child is engaged in some long and tedious work, the other children spontaneously run to the help of that child in order to enable him to finish the work quickly. They know instinctively which help is really useful.

At a certain point of development, the child brings order into an environment in which things have been left in disorder. Here, there is a certain difference between what the child does, and what the logical mind of the teacher thinks he should do. A child, does not worry about who has left the material out of place. He sees something out of place and desires to restore order, so he puts it away. The logical conception of the teacher leads her to believe that only the child who has left the material in disorder, should put it in order. She tells the child—"Stop putting away this material because it is this child who should do it." This logical reasoning never enters the mind of the child. This is the way in which adults act in society. If somebody has done harm, he should pay the penalty and no one else. This is a natural law of the adult conscience. We cannot say this is right or wrong. The child does not think in this fashion. The child loves the environment and has an urge towards order. His action does not pass through the personality of his comrades, but relates directly to the attachment he feels for the environment. He would even feel disappointed if he had nothing to put in order.

In California, a child while pouring water from one vessel into another, spilt the water continuously. A younger child, whom the first child had not noticed, kept mopping up the water. Suddenly when the older child stopped pouring, he heard the smaller child say — " Have you not got any more water ? " Only then did the child notice the small child who had been mopping up the water that he had been spilling !

If a child breaks vase, another child goes round and picks up the broken pieces and puts everything in order, consoling the child who has broken it. There is no question of who has broken the vase. Nobody questions the justice of the action of the second child. There is no punishment for the person who has broken the vase. The questions of who, why and how do not seem to arise. If in our social life, we thought in the same fashion, and we felt that we should remedy social disorders no matter who had comm-mitted them, without wanting to know who was behind them, social welfare programmes today would not be in the sad state in which they are ! To purify the environment and to put it into order is the most logical thing to do.

The obedience in our schools comes about as a spontaneous and natural phenomenon. Different levels of obedience can be seen at different degrees of development. At the first level the child sometimes obeys, and sometimes does not. In the second degree, the child always obeys the teacher, and is even capable of doing things which he does not like, which do not correspond to his needs.

Once during the practical examination of teachers who were taking our training course, three or four teachers were asked to actually teach some children whatever they knew[1]. These Italian children received lessons from the teachers as though they were trying to encourage and help them. They could learn nothing from the repeated efforts of these teachers, who taught the children only what they already knew, and that too in English, a language which

1. In the original manuscript Dr. Montessori indicates that the part of the practical examination which included the presentation of the material directly to the children by the trainees was soon eliminated from the examination procedure as it was not fair to the children.

they did not understand! It was difficult for the children, but the children did not seem to mind it. They lent themselves willingly. This enormous patience revealed by the children springs from an altruistic obedience which has no self-interest.

There is another kind of obedience, an interested obedience, which is born of the pride of being capable of the exact execution, of what is asked or ordered. The child enthusiastically carries out what the teacher has asked him to do. This command of the teacher may be compared to an examination. In the examination, the examiner asks us to do certain things just to see if we are capable of doing them. The children of our schools have presented themselves for public examinations by ordinary teachers. They took pride in being questioned, and in being able to answer. If we stop to think about it, it is natural for the child to want to present himself well when he is asked to do something. So the child gets through the examination naturally and with happiness. The child thus arrives at the third degree of development in which carrying out commands (even unpleasant ones) becomes a need.

Obedience requires a great complex, inner preparation. It is achieved naturally when the child's capacity for doing, and his inner strength for action come together. Thus not only does the child become enthusiastic about carrying out the command of the teacher, but he also desires that the teacher should command him to do still more difficult things, to give him more than he already possesses.

It is generally believed that it is the teacher who wishse to give a lesson. Therefore it is necessary that the child becomes obedient before this lesson is given. Otherwise it is not possible to give the lesson. However, the reverse is true in our schools. The child wishes to have lessons from the teacher. He wishes to study more, to receive more. So the hard task of the teacher is to learn all the things that the child asks him to teach. The teacher finds herself confronted by a being waiting to be given something, asking — "What gift is your superior intelligence going to give me next?" Thus teacher and pupil are placed in the right relation. The child goes to the school to learn, very consciously asking to be taught. With this attitude, in a positive atmosphere and in a level of calm, the task of education is facilitated.

The relation between the child and the teacher is intellectual, but there is also a spiritual relation. The child begins to love and respect the teacher. In our first schools, often the children were very poor. If these children left on the streets, found something better than usual to eat, they renounced a little of it in order to bring it to their teacher. If they found a flower, they would pick it for the teacher. There was love for the teacher and respect, as well as gratitude. These sentiments cannot be taught, they flower in an atmosphere of this kind. How can we teach an individual to love another? Nor can we command the child to respect someone. The child may be taught to show the outer form of respect, to greet a person politely, but nobody can teach him to feel respect.

What is generally known as discipline in traditional schools is not activity, but immobility and silence. It is not discipline, but something which festers inside a child, arousing his rebellious feelings. In our schools the child has free choice, he is free to move. Therefore discipline is very closely connected with freedom and action. It is generally thought that discipline and freedom are opposed to each other. The child has taught us, that they represent the two faces of the same coin, two faces of the same action. This has served to clarify many erroneous ideas.

The child can arrive at this point, if we allow him to live the longest time possible in these developmental conditions. From the moment of the first activity of the child in which the child develops an action and goes on to complete it, there develops in him a perfect discipline. This forms a nucleus during childhood and remains in the soul of the individual. Thus a perfect phenomenon takes place, a phenomenon which we adults must observe and study.

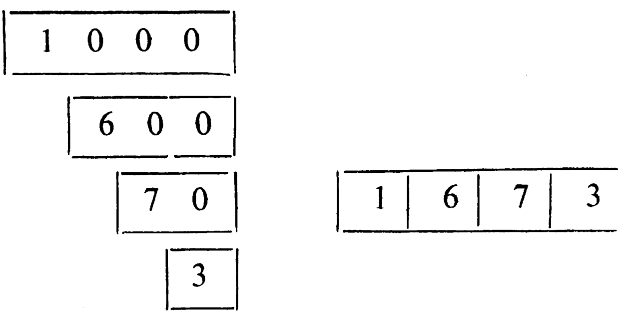
If there is any disorder and indiscipline, it means that the teacher has committed some error which has impeded the real freedom of the child. Out of this interruption of real freedom, the lack of discipline has come. This fact has been scientifically measured. The teacher must look into herself to find out in what way she has limited or restricted freedom.

We admire the freedom in nature, yet in nature everything is tied by laws. These protective laws form the base of discipline which renders that freedom possible. The stars and planets are free in the space of the universe, yet they obey laws. The stars and planets have their routes to follow. We might say among the living beings fish are most free and yet they cannot get out of water. So each being, animate or inanimate, is free within its ties, within those limits that nature has tied it up with. Freedom is thus to obey the laws to perfection, with attention to the minutest detail.

If there is no freedom there is no discipline; if there is no discipline there is no freedom. Thus freedom and discipline are the same thing, like life and existence. If adults arrive at discipline and freedom in this fashion a great social problem will be solved.

CHAPTER 6

The decimal system in its static[1] function, enables the child to see the different hierarchies of the different categories. He sees that the units have different groups—1 to 9, 10 to 90, 100 to 900, and so on. In the first hierarchy, a group of ones form ten. In the next, a group of tens form the hundred and so on. For example if we take the number[2] 1673, it is a combination of all these different hierarchies, and certain symbols which occupy a special place according to their different hierarchies are used (fig. 2). The place



(Fig. 2)

1. The material consists of nine single golden beads, nine bars of ten beads each, nine squares of hundred beads each and one cube of a thousand beads. The bead material is used with cards of the different hierarchies, 1–9, 10–90, 100–900, and one card of 1000, in green, blue, red and green respectively. These cards are so designed that if we stack them one on top of the other, for example (fig. 2) with the card of 1000 at the bottom, and the cards of 600, 70 and 3 successively on top, and align them to the right, the number 1673 is formed.

2. The example in the original manuscript is 673. For the sake of clarity and continuity we have used the number 1673.

on the extreme left is the place of the category which has the greatest importance. The child also sees that in each hierarchy there can be only nine, and no more than nine. Through this activity he also composes numbers.

When the child has understood the quantities and the symbols, he begins to want to know the names of the numbers. Sometimes this desire comes very late. It coes not matter because this is a very small detail which can be given later. Whether the child does addition and subtaction without knowing the names of the numbers or whether he is given the names first, is left to our common sense and the interest of the child.

The intelligence is like a house within which there are four apartments, each occupied by a certain entity. Each apartment has a door which opens out into an open place inside. We can call the entities — Understanding, Reason, Memory and Interest. Each of them has a special task in the house, and work together in harmony to construct Intelligence. Usually a stimulus knocks upon the door of Memory. Then it goes to Understanding. If Understanding accepts the stimulus it then goes on to excite Interest, and shakes him up. Interest goes with Understanding, to call Reason. Thus working together, they construct the Intelligence. Memory is the one who always answers the knock at the door, and takes in what is presented by the stimulus. If he is molested, he just ignores it and closes the door. Sometimes when the others see what a hard time Memory has, they too close their doors.

Education in older times was only a question of memory, not of understanding, or of reasoning, or even of interest. Therefore, the memory always took energy from intelligence. So instead of building up the intelligence, it took away from its capital in order to keep going. If we wish to help the construction of the intelligence, we must call all the four to work together. We must not leave the task of building only to the memory, who is like a servant who can do nothing but manual work. The rest of the work must be shared by the other three — interest which pricks the intelligence and keeps it alive, and understanding, which calls forth reason. If memory does all the work, it will build only a mechanical intelligence. Such an intelligence would be like a person dressed in royal clothes who tries to make other people believe he is a king, when he is really not one.

The apple that Newton saw falling was not the first apple to fall. Many people have seen an apple falling, the memory of it may be in their subconscious. However understanding comes only when the falling is explained to them. How much interest would people show in the laws of gravitation if they have not seen anything fall? It is their own experience which makes Newton's discovery interesting.

With the Number Rods the child has already become subconsciously aware of the processes of addition, subtraction, multiplication and division. However he is conscious of them by sight. The sensorial stimulus has only reached his memory, not his intelligence. He will now see these processes consciously, if they are explained to him.

Sensorial understanding helps create an interest in work. Without this we have only a vague impression in our memory. With no previous experience, or subconscious preparation, the work does not hold any interest. It is important that the child should acquire experience, as it serves to arouse the intelligence.

In Holland, water comes up if we scratch the earth a little. Thus the subconscious which is on the verge of consciousness, when scratched, arouses the intelligence. It is necessary to give the child the function of numbers before we ask the memory to learn the combinations of the different quantities, to learn that 3 combined with 5 makes 8. First the vision of the whole must be put before the intelligence. Then reason, interest, and lastly memory can come into play.

The child has already understood the function of the numbers and knows how they are formed. Now we *must* help him relate the place of quantities to their function. To do so, we have an unlimited[1] quantity of this material. Quantities can be dealt with in four ways — addition, subtraction, multiplication and division. The quantities are provided in such a way, that any operation can be carried out. That is why we have the big cards up to nine thousand and the small cards up to three thousand only. By now the child has acquired such a vision of these numbers, so we can bring them to their first abstraction, by substituting the beads in the square of hundred and the cube of thousand with wooden squares and cubes, on the sides of which squares of dotted paper are pasted, the round dots representing beads. If we count the dots, we will find 100 dots on the square of hundred and 100 dots on each face of the thousand[2]. This first step towards abstraction in the mathematical field must come very slowly. The cards are placed one below the other on the floor, and side by side, according to their hierarchies. The units, the tens and the hundreds correspond in order; for example, 9000, 900, 90 and 9 will form a horizontal line.

For this exercise in addition too, we must get the consent of the child. After the child has formed a large quantity we can ask — "Would you like to do addition? If so, you have to ask another person for help ! " Thus we arouse the interest of the child even before the game has started.

---

1. This material helps the child understand the decimal system in its dynamic function. It consists of nine wooden cubes each representing a thousand, forty-five wooden squares each representing a hundred, forty-five bars of ten beads and forty-five single golden beads. The bead material is used with one set of large cards of the different hierarchies, 1–9, 10–90, 100–900 and 1000–9000, and three sets of smaller cards 1–9, 10–90, 100–900 and 1000–3000 in green, blue, red and green respectively. The larger cards correspond in size to the cards belonging to the static function.

2. The wooden cube of thousand has only 600 dots totally on its six faces. The other 400 must be visualised to be inside the cube.

It is a psychological preparation of the mind to receive knowledge. If we take the child by the arm and make him do addition, the child's mind may be preoccupied with something else and the addition process will not be absorbed by the child. It would then be absolutely useless to waste our time and the child's in this intellectual work.

We usually offer these exercises to children between four and four and a half years as a collective exercise which two or more children can do together. When we start addition, two numbers are prepared, one by each child. Each child picks out his quantity from the bead material and the corresponding symbols from each set of small cards. He may not say their names because he has not learnt them yet. We verify the quantities to see if the children have paid attention, and also to ensure that the addition comes right. As far as the addition is concerned we have nothing more to do. All the cubes, squares, tens and ones of the two quantities are put together in confusion on a tray. We must now call in the decimal system in order to get the answer of the addition.

The first thing that the decimal system does is to distinguish the hierarchies. We put all the hundreds together, all the tens together and all the units together. We use a certain kind of felt or a carpet[1] so that the unit beads do not roll away. When the addition is complete, the number arrived at is shown using the large cards. The children who count need only to know how to count from one to ten, and to distinguish the different hierarchies and nothing more. This makes clear the nature of addition using the decimal system.

In the first addition sum, while forming the smaller quantities, we ensure that there is no carrying over. The

1. The carpet is seems to have been used originally to highlight the combining of the separate quantities. The four corners of the carpet are brought together to create a bundle effect.

activity still forms part of the static decimal system. Next comes the step where the addition has to be done with carrying. After the child has done a few of the first kind of addition sum we bring in the other kind.

The size of the cards is significant. There are three sets of smaller cards representing three different small quantities which have formed the bigger quantity represented by the bigger cards, which is the answer to the addition. The size of the card helps to fix the idea sensorially, to impress this fact on the mind of the child. Later, this helps the child to understand the rules better.

In traditional schools the child starts with the rules. In our schools, a rule is the final step taken by the child, comparable to putting a dot on the *i*. To us the rules are the most concise description of a long experience, and therefore the final step in the system. Thus not only does the definition acquire a meaning, but also has an interest in itself. The children almost compete with each other to try to express in words what has happened in the addition sum.

We also illustrate another part of the decimal system to the child. We tell the child, that in each category only nine can stay separate. So nine single beads (the units) the bars of ten, nine squares of hundred, they can stand separately. However as soon as another comes in, ten of the lower hierarchy, all get tied together, and move up as one of the higher category. If there are nine bars of ten and a tenth bar is added, all the ten bars disappear, and a square of a hundred appears. The tens are substituted by the hundred. After this[1] we may give any kind of addition sum to the child, and it works well.

In addition, different children contributed different

---

1. Before addition, an activity called the *Change Game* which isolates the carry over process can be presented to the child to help him understand that there can be only nine in any one hierarchy. A large quantity is taken out of the bead material, and each hierarchy is counted and put in order by the decimal system.

amounts and these amounts were put together. The decimal system put them in order, and through this order we got the total amount that all of them had brought. We started with nothing and got something. Now, subtraction, is the division of one original quantity into two or more different quantities. One child takes a large number (1757) from the big cards and places the corresponding quantity by its side. We must make it clear to another child that from the large amount we can take away only what is within the limit of the amount with which we started. The second child picks out a smaller number (858) from the smaller set of cards, places it on his tray and approaches the first child to ask for the corresponding quantity of beads. The child will find it easier to start from the right, from a fixed quantity. When he wants 8 ones and the first child has only 7 he has to call in the decimal system and break up the bar of ten into ten loose beads, out of which he gives away 8. He is left with 9 beads. Then the second child wants 5 tens, while the first child has only 4. So he breaks a hundred into ten bars of ten and gives away 5 tens. Then he has 6 hundreds left and the second child wants 8 hundreds, so he breaks up a thousand and gives him the required number of hundreds. Thus the quantity is divided into two different quantities.

Three children can now do the multiplication sum. Each child brings the same number, for instance 1125, and the corresponding quantities. The quantities are counted as usual. The smaller cards representing the three numbers are placed one below the other, and the answer of the accumulation 3375 is represented by the bigger cards next to the smaller cards.

We can also tell the children that three times 1125 makes 3375. In this way the nature of multiplication is explained to the child. Multiplication is an addition sum in which all the items that are added are alike. Thus the study of multiplication is to find how many times a quantity is repeated. The quantity which is repeated is called the multiplicand, the number of times the quantity is repeated is the multiplier, and the result is the product. The multiplier can be any number, it need not be three. Here we choose 3 because there are only three of the small sets of cards. Later instead of showing 1125 three times in the smaller cards, we can show it only once and show a card of three to represent the number of times it is to be added. So multiplication is clearly shown to be a special kind of addition.

We now go to the last operation, division. Division is a special kind of subtraction, just as multiplication is a special kind of addition. It presents two different forms. One is individual division and the other, group division. In subtraction when something is taken away from the large quantity something still remained. In this special kind of subtraction we have to distribute absolutely everything so that there is nothing left. Here also, as in subtraction, the point at which we start is the whole amount, bigger than what each will receive. Three children, each child with a tray, come to take away exactly equal quantities. They cannot tell us the amount they want as in subtraction, but they must be given absolutely everything, each of them the same amount, not one more or one less.

In group division, we start with a number which when divided will have no remainder. A division should be started from the left hand side and not from the right hand side. This is preferred, because otherwise we have to change at every stage and break up the tens and hundreds and thousands so often that the division becomes very tedious and long. Starting from the left it is easy and quick, so we distribute the quantities equally in this way, first starting with the thousands instead of the ones. After doing this exercise a few times we can show that these three equal quantities make up the larger one.

We offer the children long division next. Long division is actually very short, because the longer the divisor, the shorter the division. Long division has a number greater than nine as divisor. We will take a number, 1332 and divide it by 12. Twelve people are chosen, but ten of the twelve choose a leader who represents all the ten, including himself. The leader accepts his share not only for himself, but also on behalf of the other nine who have chosen him as their leader. The leader, who takes for all the ten, is given a blue ribbon in order to distinguish him from the other two who take only for themselves. These other two are given green ribbons. The children already know that a hundred contains ten tens and a thousand contains ten hundreds and so on. So if we give a thousand to the leader, we give one hundred each to the other two. And so we distribute the quantities in that proportion. The leader gets 1110 and the other two get 111 each. The leader has then to distribute what he has, to nine of his colleagues and himself. Each one of the ten gets 111, the answer of the division is what each one gets. So the amount is split into 12 equal parts, each one getting 111.

If the children have understood this, we can introduce a hundred into the divisor. Let us take 6273 and divide it by 123. Here one person who represents the hundred has a red ribbon, two people representing the tens each have blue ribbons, and the three persons representing the units have green ribbons. The hundreds get ten times more, and the units get ten times less than what each of the tens get.

How interesting it is for the child who knows only how to count upto ten to see the function of the decimal system and to know the nature of these operations. Thus the child's interest is kept alive. Learning by heart is a different mechanism which must be presented in another exercise. The function of the decimal system which remains obscure at first, is thus to put the hierarchies in order. The children must go on with the operations even if there is an error. Usually they will not recognise an error because they cannot verify anything except the quantities. What does it matter if it is wrong? What is of importance is not the answer but its function. The exactness of calculation will be learned by the child later, when he comes to it[1].

---

1. Dr, Montessori's Italian book *Psycho-Arithmetica* has yet to be translated into English. In it are detailed descriptions of the arithmetic material and the technique and order of presenting them to the child.

CHAPTER 7

One of the questions educators ask is — "How can we make social sentiments arise in the hearts of children ?" Another such question they ask is — " How do we teach children to be obedient? " In our schools we offer the child certain special conditions and then see how social sentiments develop in him, if they develop at all.

The adult is very anxious to awaken obedience in the child, as he is concerned that the child should recognise him as the master. His concern is certainly not to develop in the child the obedience which forms part of social rules he has to obey later on in society. Obedience is not a sentiment to be developed in social life. Indeed as there is too much of it in the world already, this should not be our concern as educators.

Through observation it is we who learn. From what we have observed, obedience comes naturally when there has been preparation. There are such delicate shades of obedience that we have to be careful not to take advantage of it. Obedience comes from a force which is a key to the union among beings, a strength which keeps humanity together. This obedience ends by uniting the pupil with the teacher. At this level, obedience in the child is born from his interest, as he can expect more from the teacher than he would be able to take in by himself. This interest urges the child to take from the teacher higher and superior things, thereby establishing an attachment. The attachment of the child to the teacher is similar to that which adults have towards a leader. Obedience thus comes naturally to the child when the desire to learn is aroused through orderly activity in an orderly environment.

There is another kind of obedience which is a sort of adaptation. We saw how children adapted themselves to serve as the means of an examination to many students who had to teach them in order to pass the examination. This adaptation for another person, a consent to the environment is the key to social union. This obedience is offered with delight. It is born of a profound instinct in man to obey someone and to attach himself by this obedience.

What we see in children is a natural phenomenon that leads to discipline. The kind of obedience which is generally required from the child is a submission to nature, and as such it is passive. However, obedience which arises and develops from an activity is different. It brings discipline and natural order to the environment through the bond between teacher and pupil.

It is not sufficient to abandon oneself to this natural development because it is necessary that there should be some fixed rules besides those that the teacher may give from time to time. So there are certain established actions in the environment which do not depend on the passing actions of a teacher, some rules which fix certain fundamental things in the environment. For instance, we say that all objects must have a place in the environment and that each one of them must be replaced in its proper place after use. So something that belongs to the environment which is independent of the commands of the teacher, establishes a certain rule, and insists on the maintenance of order in the environment. Keeping the material objects in order in the environment is of great help later, when it enables the child to arrange certain groups of actions within a certain time. The orderly placement of the objects in the environment, and the planning of action within a certain time span are both rules.

When we obey these external rules with great exactitude, we do not follow a timetable imposed on us by any exterior agent; we think out a plan of our own activities during the day. The idea of order fundamentally underlies our ability to put an object in its proper place. It would be ideal if the child arrived at remembering that at a certain time he could do certain actions, and that he could not do certain actions at other times. In order to perfect this, we can neither give a command to the child, nor ring a bell. It is however, necessary to develop in the child a certain sentiment towards time.

It is a fact that the sun comes up every morning. It never takes a vacation. Just as regularly as it rises, it also sets. In doing so, it goes through a certain amount of space; the period taken to cover this space is what we call time. So we place within the reach of the child something that measures time — a clock. We can make a cardboard clock with all the markings and the hands, to help the children to tell the time even though they do not as yet know the numbers. Another way is to have a sundial which makes it possible to tell the time by the movement of the shadow of a stick. This natural way of measuring time also interests the child very much.

School begins at a certain hour and ends at a certain hour. We obey this as a rule. Let us therefore, take these two limits to show what time means. The child is a kind of a clock in the family because it is the child who says first — " It is time for me to go to school ! " When school ends, the child realises that it is time for him to go home. We can set down a rule about the closing time of the school without interrupting any formative activity. If at a certain hour, the children run away leaving everything as they have used it, certainly it creates disorder. So we must tell them five minutes before closing time, so that they may make preparations to leave and put things back into their places in order, so that the school may be as clean and as orderly asit had been found. We may then ask the children to do something just before going home — to sit for a moment together, to say a prayer — and then to leave the school in an orderly fashion, silently. This would be imposing an external order related to time. It is more difficult to carry this out in the morning. When the children come to school, they come in with a certain impulse towards work. This external order would then interrupt this impulse. If the morning is very long it may be interrupted by a small recess or by a walk in the garden. This recess should be taken into consideration to know how much time there is at the child's disposal.

Slowly, the ability to take into consideration beforehand, the time at which this interruption comes, and the time at which work can be done, develops in the mind of the child. These two things — replacing everything in its proper place, and this command of the school hour and therefore the necessity of planning one's actions in accordance with it, help the child to keep order. These two rules, are absolute rules, absolutely independent of the command of the teacher. So there is an inner order, immemediate obedience to a person; and external order obedience to law.

Absolute laws are few in number. They might be compared to the tastes which are only four in number, but what an infinite number of sensations they present! There are other laws which are not absolute and which multiply in number and these might be called rules. A rule helps the child to perfect his conduct in the environment. How much joy the child derives by doing something which depends on his own will, which he learns in order to do things well!

One day, I was visiting a school. I was sitting on a chair and two or three children continuously passed in front of me and said — " How do you do, Madam Montessori ? " Every time they passed in front of me, they would repeat the same words — " Excuse me ! " They had been taught to say these words when they passed in front of a person. They liked to say this so much, that they passed in front of me continuously. The teacher had forgotten to tell the children that they should not pass in front of a person if it was not absolutely necessary, she had merely given the rule. Then the children were told that they should not pass in front of a person unless it was absolutely necessary. So the children did not pass in front of me, but slowly moved back the cupboard behind me in order to pass.

Children like rules; they like to obey them. We may give a child this rule—" If anything falls to the ground, we must pick it up ! " We will at once see the child throwing an enormous number of things on the ground in order to pick them up. So we must be very careful and say — " It is right to pick up things that fall, but we must try not to let things fall on the ground ! " Similarly the child must be told that waste paper is not to be thrown on the floor, but into the wastepaper basket because that is the place for waste paper. We can give the child a rule—" When the table is dirty, it should be washed ! " The child likes washing the table so much, that instead of drawing on a paper, he begins to draw with pencils on the table, and then religiously sets about washing it. So we must tell the child that we should not make the table dirty.

As these rules are connected with casual actions, the child will solve all problems by himself once he knows the rules. As the school develops, these rules grow in number. We term this good manners, or social education — to be able to behave in society as society expects. So there are two laws which are independent of the casual action of the individual, and there are rules which are related to these casual actions.

Certain rules distribute the actions of the individual within a span of time. When lunch is served in school, there are those who leave things as they are after they have finished lunch, and there are others who clear up everything, and there are others who merely wash their hands and eat. When the children are a little older and know how to read these rules, they like to have them written out. They like the rules so very much that as soon as they come to the school, they go to the notice board where these rules are put up to see what their part is. The child who has to set the table never forgets to look at the watch, so that he may go before the others, to set the table in such a fashion that when the others come, all is ready. He is very glad to serve at the table with a clean apron on. Indeed it is the greatest disappointment for the child who expects to serve at the table to merely to eat with the others! Thus not only does the child obey the teacher, but also the laws.

All social life is organised around this basis of obedience. If there was no obedience, it would be necessary to order the chidren to do this or that. Thus social life develops first through inner development, and then by obeying the rules of the environment. The child is content to obey these rules, because he has the ability to carry out twhat the rules indicate. Such organisation leads slowly to the division of labour and to the setting of one's actions in a specified span of time. Thus the children have social experiences which lead to social organisation. In our schools, we see that there are two groups of actions. In the first group of actions, the child learns how to read. He also learns how to make the necessary movements for writing. When he learns arithmetic, then he learns everything to which it is connected. The other group of actions represent what we call social experience — the placing of ourselves voluntarily in a known order.

These rules for children between three and six years of age are accepted by the child with enthusiasm. They are the inner laws which rule a house. We see that in this little society, in this little group of people in a closed environment, there is a superior being — the teacher who can give the group many new things. In this environment there are also many objects which have many different uses. The child is active, and comes into relation with others like him who are also active. There are certain interesting rules, not rules regarding the material objects, but rules which the child follows voluntarily. By following them, the world becomes an easier place to live, more harmoniusly adjusted.

In all the ideas of life that will follow, social experience and social organisation will always exist. They will grow with the child, and become more and more complicated. The society through which the child moves will not always be a closed environment. There will be other more complex forms of social life which will need to be organised when the child grows. It would no longer be sufficient for the child between seven and twelve years of age, to know that if he passes in front of a person, he should ask to be excused, nor does his turn to set the table for dinner satisfy him. Such organisation would no longer retain the interest of the child. The enthusiasm and interest in following small rules must however be kept alive in the older child. Therefore, we must think out a social form which is more complex, which will arouse and satisfy his interest and enthusiasm. These social experiences are closely related to personal pride. The older child does not feel pride in saying — " I know that before going to dinner, I have to wash my hands!" It will however be an enormous achievement for the child between three and six years of age to know that.

It is an immensely important task of education to prepare for the child a social experience which will contribute towards the periods of life which are to follow. An adult man will be expected to take his place with pride in a society which is very, very complicated. He will be well prepared to do so, if in the different periods of life he has been able to carry out social experiences which have been successively more complicated and important.

Nothing is more dangerous than disorder and a lack of conscience in obedience. Look at all the groups of men who obey when commanded to do any action ! Whəther to kill or to build — they obey with the same passivity and lack of conscience. It is in the instinct of man to obey, yet he does not know how to obey or what to obey.

It is thus extremely important to know the meaning of obedience. Otherwise adults will always understand obedience to mean doing whatever the caprice of a bigger person commands. Obedience is not a passive factor, it has an organising power which must be kept alive. So man must be the holder of his own obedience and he must be capable of disposing of it. He must know how to obey. He must understand that it is necessary to obey, for his own defence and the defence of his society.

CHAPTER 8

We are very ready to break the life of the child into many parts as though the child is a different being in different parts of the day. Perhaps childhood is the phase of an individual's life, which shows better than any other how close and compact is the unity of life. Besides the development of intellectual life and social experiences in the child's life in the school, there is another factor of equal importance which is very little considered. Very often, the child spends only a few hours at school. His life cannot be limited to his experiences in school. There is another part of his life which is very important — his family life.

In school the one thing of fundamental importance, is the point from which everything starts, to which everything is related — when the child free from his ties, fixes his attention upon an external action and concentrates his whole personality in some activity. The environment of freedom that we offer serves to bring forth this development. We might ask ourselves — " Is there not also in family life a central point that might be isolated or individualised ? " There is such a central point ; the beginning of sentiment on which depends all the further development of sentiment in the life of a man.

It is good to have a very clear and thorough knowledge of these; otherwise, we will make family life an imitation, a reflection, of school life. Up to a certain point this may well be so. The mother may try to find an occupation for her child, to give the child that freedom of action which he enjoys in the school. She may have understood the need to avoid sharp commands. In school, there is a teacher who might be called an artificial mother and in the house, there is the natural mother. We might then say that the school life and the family life are but the two pages of the same book. Yet in family life there is something special which the school cannot copy, which the school cannot offer.

Therefore the family needs to be prepared in order to respond better to the needs of the child. It is not by a method of education that this can be achieved. It can be acieved only by something which is more fundamental. Here too there is a phenomenon of growth, a central point must be formed, which may be called a nucleus. This central point, this nucleus, might be described by a single word — love. Parents do not realise that by becoming parents they have undergone a great change — a change much more precious than that which can be achieved by a teacher no matter what method she adopts. This change which is of extreme importance, takes place not only in human beings but in all living beings.

Ferocious wild animals that fight in their natural environment undergo a great change when young ones are born to them. They become full of tender care and love, and acquire characteristics that are entirely different from their usual ones. This in itself is a formidable change.

A natural characteristic of birds is flight. As soon as any small danger threatens them, they fly away. Suddenly, at a certain moment of their life, they change their instincts. Instead of flying from place to place, they fix themsclves to a spot and begin to work, building their nest. Then they do something which they have never done before; they gather food for the little ones. Even if danger threatens they seem incapable of flying away, and seem to be attached to the spot where their nest is.

Certain butterflies, all of a sudden seem to acquire the power of reasonging. They lay their eggs on the underside of leaves in order that they may be protected from the rain which might otherwise wash them away. It must be very difficult to stick the eggs under the leaves upside down, and yet they do it. Who would have imagined that butterflies could be so intelligent?

Certain spiders in cold countries construct their nests around their eggs in such a fashion as to form a double wall. In between these walls is an air chamber which protects the eggs against humidity and cold. Who could have imagined that a spider had the idea of a double wall even before any man invented it? Mankind only in these last ten years or sohas realised that in order to protect a house from the cold a double wall[1] is necessary. Certainly, spiders do not use their own intelligence or reasoning to build this double wall. This is even more extraordinary because it shows us that these creatures have two kinds of instincts; one deals with their ordinary life, and the other deals with the protection of its own species.

We might ask — " Is the human being the only animal who does not show these changes? Does man always have the same instincts? " Psychology, the study of the behaviour of the human being, shows us that such a change does take place. We must take into consideration this change which occurs in man, and the contribution it may make to social life.

It is true that man in the course of life undergoes a deep change in his feelings. However he is not very conscious of this change. The adult being acquires and takes possession of an egotistical conception of life, for his instinct is to acquire as much as possible for himself. Certainly, one of

---

1. Sir James Dewar, a British chemist invented the thermos flask in 1892. The design blocks the three processes by which heat is transferred — conduction, convection and radiation. This principle became widely used in the insulation of houses to help minimise the loss and entry of heat.

the greatest characteristics of man is something which is made up of care for oneself, and avarice. How careful is man in giving away a little bit from the money he possesses! Even if he gives it, how suspicious he is and how many details he wants to know as to how it is to be used. When a rich person sometimes bestows upon another person a great sum, this person must possess many qualities which please the giver. Who can persuade such a man to free himself from this attachment, and detach himself from all material things in order to give everything that he possesses to somebody else? It would be very difficult to achieve. When we look upon the great teachers, upon the founders of religions, we must acknowledge that they have given such advice to human beings. However this advice is most difficult to follow. Religous sentiment rarely touches and changes the heart of man.

Consider the new-born child! He is just a small mass of flesh, completely unknown, with no beauty, or form. He makes no response to the love that we bestow on him. Yet from the time this child is born, possessiveness ebbs from the heart of his parents. They think — "If we become rich, the riches will go to him." Everything that they do is centred round the child. So far from being egotists, the parents become altruists. We see a complete change in the instincts of the adult, every man and every woman.

The form of life represented by the small child who grows in the family, is very special, and is of great importance in later life. We can say that the child wishes to be the centre of the love and interest of his parents and others. From this important fact of creation is born a nebula[1] which begins to condense itself in order to form a new being. This

1. The nebular hypothesis is based upon the theory that the bodies composing the solar system once existed in the form of a nebula from which the planets and the main body forming the sun were constituted, when condensed by refrigeration.

may lead us to think that the child is an egotist. We frequently hear adults say children are selfish. If the parents believe that the child is a selfish being, and try to correct this so called selfishness in the child, they commit an act of dissolution. They dissolve the nucleus of the nebula which is in the process of condensation.

So the parents need to be prepared. This idea should be made clear to them. In order to be the centre of attraction, the child lives in an atmosphere of love. He keeps the attention of the people who are concerned with him on the basis of love. Adults should collaborate to develop the star which is forming from the nebula. It is usually the adults who have confused ideas on this point. A special branch of medicine, called psychoanalysis, attributes many of the abnormalities found in man to his treatment as a child. The child who perceives that he is not the centre of the love and interest of the family, suffers a dissolution. He undergoes such suffering that he loses something, and this loss interferes with the development to be achieved in later life.

There are many children in this condition, and this fact has aroused the attention of doctors. The father of a family has a job which takes him to a country, very far away. This in itself affects the child who thinks — "How is it that my father goes away from me? What can be more important to him than me? Am I not his child, the centre of his love? Is there something more important than me in the life of my father?" The child begins to reason out for himself his father's absence. The mother stays with the child, who is consoled — "After all my mother is here. She will never find an interest greater than me in her life!" The father who has been away a long time arranges some kind of comfort for the mother who has to join him. She tries to persuade the child — "Your father is calling me and I must go." This fact has been found to be at the root of the trouble, of problems that develop afterwards. The child is persuaded that in the life of his mother there is something more important than himself, that the father comes first in the family, and is to be preferred to the child. When both parents go away the child suffers an inner perturbation, which affects the rest of his life subconsciously.

The strange part is that if a child in this condition goes into a school, he is found to be less intelligent than the other children, less intelligent than he should be. It is extremely difficult for this child to concentrate on his work. It is extremely difficult for him to find order and to achieve calm. So we can say that the intelligence which deals with the acquisition of culture and so forth is influenced by all the factors of life. The personality of the child is an absolute whole. If the child cannot concentrate, if the child is not intelligent, if the child cannot follow a normal course while all the right conditions exist in the school, then perhaps the key to this abnormality may be found by the looking into his family life.

All that happens in the family should be considered as forming part of the child's subconscious mind. The family makes a special contribution to the child's psychic life, and therefore it is important that the family should be prepared and shown what task is to be performed in order to assist the psychic development of the child. The family, unconscious and ignorant of the facts, must be educated. The word love generates many false ideas. It is very often incorrectly used, and the child is accused of having this or that defect. The school thus also has the task of enlightening, determining, and rendering more clear the consciousness of adults with regard to the child.

CHAPTER 9

When the child is born, he is like a nebula descending upon the parents. The child takes matter from this nebula to form a centre of life around himself. Something similar occurs in the physical life of the mother — a change, which produces the food which her child is able to absorb. It has been proved that the future health of the child is very closely related to this period of breast feeding. Similarly, psychoanalysis has recognised that the period of the child's life, in which the child must become a centre of attention and love, has an influence on the shaping of his adult character.

Two factors must be placed in relation with the defects in human character as they are studied today — the repression of the child's activities, and the false interpretation of love, leading to a lack of centralisation. We can thus say that just as physical malnutrition occurs, when the mother does not have enough milk for the child, psychic malnutrition occurs due to a lack of spiritual nutrition. Many of these children later on present defects of character. These defects are so extreme, it is difficult to live with them, or deal with them. Usually, if these two factors are found and remedied, the faults and defects of character that the child is accused of disappear.

If everything is done for the child, he is not allowed any activity. Often parents cut themselves adrift from the child, as though his need is merely that of being fed. Such children suffer from psychic malnutrition. This lack of affection leads the child to believe that he is of no importtance to his parents and of no importance to anyone. A sense of the value of his own personality, is a vital nucleus, which gives the child strength. It is in fact an impulse which is closely related to the development of the intelligence, and the common joy in childhood that the child seems to possess. When indifference is shown to the child, not only does he become disillusioned but there also arises in him a feeling of rebellion. This rebellion fixes itself in a set of actions that are judged as the naughtiness of the child, as tantrums.

Once, adults close to a child insisted that he should eat in an orderly fashion. The child reacted by making as many spots on the table-cloth as he could. He also threw all the crumbs from his plate on the cloth, and then on the ground. The more they taught him not to do it, the more he did it. Perhaps the child thought — " Nobody in the world does anything for me,why should I do anything they ask? Everybody is bad to me and I will be bad to them!" The adults then called in a nurse who was considerd an authority on this subject. They told the child—" This nurse will now take care of you." When the nurse came near the child, he just looked at her as he and threw everything on the floor ! The nurse did not say anything to the child and the child continued to do this two or three times. Then one day, the nurse said — " What a pity, the bread crumbs are wasted. Instead they could be given to the birds in the garden ! " The child immediately became interested, picked up all the crumbs and went into the garden and gave them to the birds. From that time, the child stopped throwing things on the ground. The tantrum was not repeated. The nurse told the parents — " Well, perhaps this child is now cured of this special defect that troubled you so much, but if you want a better cure you must make him feel that people around him consider him the centre of their life."

This form of selfishness is a characteristic symptom of childhood. It is a characteristic which in fact gives us a key to the things which will interest the child, and shows us how things should be presented to him. For instance, the child at this age likes to be the centre of interest. He likes to feel secure and protected. So, if we wish to instil religious sentiment in the child we should tell him that he is in the very special care of God, who looks upon his every action. If the child is sleeping, God looks after him. While he is working God protects him. God even sends the child an angel who never leaves him to keep him company ! Perhaps this need is not exclusive to the child, but one that we all share.

We adults, for instance, may take pleasure in some work, we may have some special amusement, but we must have a special person who is concerned for us in a special way. If this is lacking, what becomes of our courage? The employment is there, the amusement is there, success is always there, but life seems lacking. We need someone who has faith in us, who is ready to defend us and take up our cause. There may be thousands of people who think ill of us, who say the most unjust things about us, but there is one person who knows us, who has faith in us, who sympathises with us, and recognises the good in us, someone to whom whatever we do is always justified. We may be ugly and badly dressed, but this person always seems to find something in us which is beautiful and elegant. In a world with thousands of enemies, we have one person upon whom we can rely. If it was not for this person's faith in us which gives us faith in ourselves we could not go on fighting. This person's affection lends us courage to live in this crowded and difficult world which is full of people who do not appreciate us, who do not even know us.

Being the centre of someone's interest is an essential part of life. We must therefore be careful not to judge the child selfish because he wishes to be the centre of someone's life and love. If, for adults who have so many interests, this is of such vital importance that its lack leads to a loss of interest in life, imagine what it is for the child. When we fall, even strangers would probably help us, and bandage us. Yet although they sympathise, we are of absolutely no importance to them, and they do not feel anything for us at all. Therefore, the material help offered by a teacher in the school or by the adult who prepares a good environment, or by the nurse who bandages the wound is not as important as the faith that someone has in us. The first support of human life is faith.

The mother of the child is the most beautiful person in the world to him. She is like God to the child. She has faith in him. She is his security and his protection. When the child sees somebody who is beautiful, he says — " She is just like my mama." When as adults we find ourselves alone for a few minutes without our mother, when she is far away, although we are advanced in age, we feel the lack of this person ! Grown men who go to war as soldiers undergo many experiences. When they find themselves in difficult conditions, when they feel the need of support, to whom do they turn? Usually it is to their mother !

The parents of the child are beings w o live for him, who are filled with joy when the child is happy, and comfort him when he suffers any pain. He is the real centre of his parents' affection. The child feels that these two persons defend him, watch everything that he does, and appreciate him. He feels that whatever the parents tell him, they do so with love, and that it is always true. He knows that he has in them friends who are more than sure of him. He believes that they are proud of him. What could we call this if not absolute faith? This first form of faith which is the nucleus of the child's life, is love.

If this centre of affection is lacking in childhood, the human soul grows distorted, as in the case of people who are cynical, who lack things that the others seem to consider as sacred. Indeed it seems that something has not had the chance to develop in their souls. A number of disorders may arise from this. These are not disorders of action, but disorders of function. They are brought about by mistaken ideas of the need of a lofty education in certain spheres of society, or by the fact that it is considered right that the child should be left to the care of a nurse so as to leave the parents free.

There was a young man about twenty-two years old, who was engaged to be married to a young lady, of about his own age. This young lady was every nice and good-looking and of a very gentle disposition. The young people were officially engaged and it looked as though they would be married one day. As the date for their marriage approached, this man found some fault in this young lady, and he fell desperately in love with a woman who was about forty-five years old. This of course threw the poor young lady into despair. It was a mystery to her why he should fall in love with an old woman.

The explanation given by the psychologists was that this man as a child did not have his mother's love. Therefore, he projected this unfulfilled desire for his mother's love upon a woman older than himself and fell desperately in love with her. Perhaps she would give him the advice which his mother would have given him as a child. For instance, she might say to him — "Now dress yourself well, and come back to dinner in time!" These things attracted him to the older woman who would think of all his little needs and protect him. When he found himself with two loves, he chose the one for which he felt the most need. For a time this securing of a mother's love through marriage would satisfy him. He did not marry the young lady because he would have had to take care of her! What happens in childhood is imprinted in the human soul. It is thus essential that the child be the centre of somebody's affection; that whatever the child does is considered with interest by that person. So parents need to take care to make the child the centre of their affection, and to give him the love of which he has so much need.

CHAPTER 10

In our schools, a lesson is a very long process. A beginning, and an end — these are the only things it has in common with lessons in traditional schools. The lesson suitable to the sensorial period, for a child between two and a half and five years of age must appeal to his intelligence at that particular moment. The same lesson is not suitable to a child who is older. It will not interest or thrill an older child as his intelligence will have taken another form.

The first stage of the lesson is the initiation or the presentation. This is done without words. In order to build the Broad Stair, to see the differences between the narrow prism and a broad one there is no need for words. The differences are seen with the eyes. The exercise is one of visual perception. Initiation means to show the child how the exercise is done. After the child is initiated into something new, we leave him there at the beginning of the lesson.

From this point, it is no longer the teacher who gives the lesson but the material. The experience that the child gains from it, is the second part of the lesson. The child, using the material builds up his intelligence. In this period of the ripening of the intelligence, the child is active and acquires development in a certain direction. It is certainly beautiful to see the child learn with the material. However, what happens to the child, what happens within the child, is not for us to know. This is the secret of the child, the work of God functioning in his soul.

We all eat although the food we eat may differ. The cook, prepares the food and places it before the person who is hungry. However what happens inside the body of the person who eats the food is not for the cook to know. That is the secret of the person, inside whom the little cells are actively taking nutrients from the food. This need not concern us. Therefore what happens to the child while he is partaking of this mental food prepared by the teacher, and what goes on within the child when the material is presented, must not be interfered with. This period of assimilation and experience is the longest period of the lesson. In this process the child incarnates this knowledge in his subconscious mind, and allows it to permeate his soul, his spirit, and his body, yet without being clearly conscious of it. It is like the beating of our heart. We do not pay any attention to it, yet we are subconsciously conscious of it.

In the third part of the lesson, this vague subconscious knowledge must be made conscious. When the teacher, taking two prisms of the Broad Stair, says that one is thick and the other is thin, the knowledge of these differences that the child has already perceived sensorially will emerge like a grain of salt stirred into a saturated salt solution. The knowledge which was dissolved in the solution of the subconscious accumulates and becomes visible forming a big crystal. This lesson may last, for three or four months, or only a week or two depending on the development of each individual child.

The need to be the centre of our attention, of our love, is in the soul of the child. When we bring something new into the child's mind, we must dedicate exclusively to the child, the few minutes needed to offer him these items of knowledge. No matter what happens around us, no matter who calls us, only one task must exist for the teacher at that moment, the imparting of the lesson to the child. The child knows that during these few minutes we exist for him alone and for nobody else. He feels that she is giving him something. It is like a mother feeding her baby. From the teacher the child receives the help that his mother cannot give. The child is shown indifference by the teacher, if during his lesson she is called away by another child. This would be like a mother, who in order to be kind to everything, leaves her hungry baby and goes to feed the fly that is passing. Before giving the child a lesson, we must look around the environment to see that everything is all right, but while we are giving the lesson we must not let anything disturb us.

CHAPTER 11

We offer the child a board which contains rough and smooth surfaces for touch. To the left of the first board is a coarse kind of sandpaper, and to the right a very smooth paper, so when touched the contrast becomes very sharp. Then we offer another board which has alternately ten sections of the same roughness and smoothness. Then we offer a board in which there is a gradation of roughness. To the left is very coarse sandpaper which is the roughest, and then sandpaper which is successively less and less coarse, so that the child feels six[1] intensities of roughness. We also offer a gradation of smoothness, starting with a slightly rough surface which is almost smooth, and then successively smoother and smoother until the last very smooth surface. The Touchboards we call fixed material. The rough and smooth surfaces are fixed to the boards.

We also offer the child the same material as six pairs of loose tablets. This material is spread on a table and the exercise is to find the pairs by touching them and recognising the identical textures. This exercise is done with the eyes blindfolded and the control of error is visual because when the child opens his eyes, he sees the difference between the bigger grains of the rough sandpaper and the one made of finer sand. We also offer the child pieces of leather, cloth, marble, iron and almost all the objects that were used

1. Today the third and fourth Touchboards and the Touch Tablets offer only *five* graded intensities of roughness and smoothness.

to help him become aware of his thermic sense[1].

It is not necessary to wash the hands in order to feel the roughness or smoothness on the first two Touchboards[2], but washing, rubbing and massaging of the hands are necessary for the other boards, in order to acquire the lightness of touch. On the first two boards, it is only the question of the recognition of the surface. For the gradation, it is always different intensities of roughness and smoothness.

We do not offer the child the study of differences in dimensions[3], at the age of three. It is offered when the child knows how to write, usually between the age of four and five years. All the other sensorial materials are offered earlier. However this appeals only to a child who is more developed. We do not know why this is so. In order to distinguish them, we have made each series of a different colour.

With closed eyes the child must recognise the impression that these objects give him. If he takes two objects in his hands, he must recognise the thicker one, the smaller one and all the other qualities that stand out. The others who are watching should not make any noise, because by noise or laughter, they will be influencing the child doing the activity, as unwittingly he will become more sensitive to the public, than to his own senses. In such a case, his perception will not be clear. Some of the cylinders are so very nearly alike that it is difficult to differentiate between

1. Today only different textured fabrics are offered to the child. Thermic Tablets made of marble, iron, wood, felt and slate are offered later after Thermic Bottles.

2. Today we show the child how to sensitise his fingertips before any tactile activity including the first Touchboard.

3. This material called the *Coloured Cylinders* (sometimes called *Knobless Cylinders*) corresponds exactly in dimension to the cylinders in the Cylinder Blocks. The series of cylinders which correspond to the cylinders of Blocks A, B, C and C1 are painted blue, red, yellow and green respectively.

them. This is a sensorial exercise not an exercise of muscular memory. The hands must be kept apart and not close together, so that each object is felt by one hand alone. The contrasts are easier to find by feeling. The child must try to distinguish the qualities in a sensorial fashion and not by the muscular memory, as the latter way is much easier.

This material is not used to offer the child nomenclature. It is presented to him when he already knows the names. If the coloured cylinders are superimposed on one another, they give a better impresson of their differences. The cylinders can be arranged in many different ways — big to small, side by side or even one upon the other. When the yellow cylinders are graded we see a harmonious progression. When the green cylinders are graded they look out of proportion. When three cylinders of the same height are put side by side the difference in their sections may be seen.

This material offers the child many mathematical problems. Sometimes, the child examines the cylinders to see if they have anything in common. He sees that some cylinders are alike in thickness, and that others differ. He also sees the differences in diameter. This is a more scientific examination of the cylinders than a merely casual sensorial impression. When the material is given to the child, he confronts the differences. As he begins to confront these differences one by one he begins to see their relation.

CHAPTER 12

Arithmetic and the learning of the names of single numbers (units) is an area which is left to the common sense of the teacher. The child has already undoubtedly seen the succession of numbers through the decimal system, that from one ten to the next ten we have different groups. However, when the numbers were read, the correct name of the number was given to the child. Sometimes the names of the numbers can be offered to the child earlier, and sometimes later. Either the child asks for the names or the teacher gives him the names of the numbers between ten and twenty. Here too there are three periods. The first step is to offer the child only the quantities in beads. The second step is to give only the symbols. The third step is to help the child associate the quantity with its symbol.

The greatest difficulty for the child is always with the small numbers, not with the bigger ones. The visual differences have been already noted by the child. As far as counting is concerned, he merely has difficulty in remembering the names of the numbers. The first twenty numbers present the greatest difficulty to the child; after twenty he only meets with a new name in every ten[1]. Even those are somewhat similar. In thirty, forty, fifty and so on, he has

---

1. In the earlier manuscript Dr. Montessori mentions that she had tried to present the numbers between 10 and 20 using the Number Rods. As this method proved to be too long and difficult for the child, and did not serve to impress upon him the concept of 10 and a unit, it was given up.

only to add three, four, five and so on. So for the child who has already learnt one to ten, the real difficulty is the learning of the names from ten to twenty.

Psychologically, we must present these new names between ten and twenty to the child in such a clear fashion that each of them is individualised. We must also show clearly that each of them is a combination of ten with one of the first nine numbers. First the quantity without the symbol is presented and then the symbol without the quantity, and lastly both of them together.

We can show the child the quantities between 10 and 20 using a bar of ten golden beads and a single bead. We call it eleven. This combination is very visible. We continue to place the beads one under the other until nine have been added, giving the names upto nineteen at the same time[1]. The child already knows the names, but he does not until now know the order. To do this we can also use coloured bead bars in which each number from 1 to 9 is individualised by a special colour. The unit 1 is red in colour, 2 is green, 3 is pink, 4 is yellow, 5 is light blue, 6 is chocolate brown, 7 is white, 8 is grey, 9 is dark blue[2].

Then we offer him the three period lesson asking him to form one of the numbers between 10 and 20. We could also form any quantity from 10 and 20 and ask the child to say what number it is.

As the next step we present a board[3] on which there

---

1. Today during the Name Lesson we offer the child only two or three new names at a time.

2. Today the colours of the bead bars from 1–9 in India are red, green, pink, yellow, light blue, grey, white, purple and dark blue respectively. In some countries the bar of 8 is light brown.

3. *Seguin Frame I* consists of two boards, each divided into five compartments with grooved pieces of wood. Each compartment (except the last one) has the number 10 on it. There are also loose number cards from 1–9 which can be slid on top of the zero in each compartment making numbers from 11–19. *Seguin Frame II* is exactly the same except the compartments have numbers 10–90 in succession.

are five tens printed one below the other, and another on which there are four more tens. In between the one and the zero in every ten, there is a piece of wood which will stop a card sliding across. The symbols on the board are printed in black. As the child already knows the formation of numbers, we have only to show him the different individualised quantities. Just as we individualised the quantity with the beads — for instance, the ten with a bead added to it, so also here there are separate unit cards. We can go up to 19. At 20 there is a change in name. This is the second step.

The third step is the combination of the symbols and the quantities. We place one bar of ten and a single bead by its side and change the symbol on the board from 10 to 11 by sliding in the unit card.

There is another apparatus[1] in which we find the squares of numbers. Just like the square of ten, there are squares made of bars of 2, 3, 4, 5, 6 and so on upto 9. Each one of them forms a square of the number represented by the bar. We also have a square of the numbers in the form of chains. There is a chain of 10 tens which also forms the square of ten, a hunrded beads. This chain offers the child a glimpse of the linear quantity of hundred. When he sees a hundred beads in a square, he may not count all the units, but when he stretches the hundred out into a long chain of beads, it gives him a better idea of what a hundred is. The

---

1. The *Short Bead Chains* for quantities from 1–10 are made up of respective coloured bead bars. The number of bars on each chain correspond to the number of beads on each bar. There is a bead square for each chain made up of the total number of beads on the chain. There are also arrows for each chain in the corresponding colours. The *Long Bead Chains* for quantities from 1–10 are also made up of respective coloured bead bars. The number of short bead chains on each long one corresponds to the number of beads on each bar. There is a bead cube for each chain made up of as many beads as are in the bead cube. There are also arrows for each chain in the corresponding colour.

only difference between a hundred and a thousand seems to be the addition of zero, when we look at the chains of hundred and thousand, we see what a difference this zero makes. The chains of hundred and thousand, offer the child a clear comparison of the quantities in terms of length.

The material used for counting is no longer the bead material used earlier to introduce the decimal system. He now understands the stretch of the chains because they increase ten by ten. These tens, hundreds and thousands are signposts that the child passes on the path of linear counting. It is not merely a mechanism of individualising quantities but a method of offering the child the secret of value. We showed the child that only nine of any group can be loose, and that when they become ten, they form a new unit. In the same way, here we see that to pass from 10 to 20 we must pass first from one to nine, and then to 20.

When we get to 20, we have similar material, two boards on which 10 to 90 are represented, and again start adding from one until all the nine are exhausted, and we get three tens — 30. So it goes till 90, changing the symbols on the board everytime.

Linear counting is called the passage, because it helps the child to go from one milestone to the next. When this idea is clear to the child, he becomes crazy about counting. The chain of thousand becomes very interesting, and he counts the beads one by one. The child likes to mark the milestones from ten to ten. He has a set of blue cards[1] on which the tens are written in order 10, 20, 30 and so on upto 90. Along the chain of a thousand, every time he meets a ten, he places the appropriate card next to it. When he comes to 100, there are larger cards in another colour, red.

---

1. Today these cards are referred to as arrows. For more details see the chapter entitled *Square and Cube of Numbers*, in *The Advanced Montessori Method*, Vol. II.

They are in order 100,200 and so on. Thus the child goes on counting the whole thousand.

It is often tragic for the child to leave this work and have to start all over again. It has sometimes been observed that when due to some interruption the child has to stop in the middle of his counting, he takes so much interest in it that he puts a string or a mark at that spot so that when he comes the next day he can start from the place where he had left off. It seems incredible, but it does really happen. The child has worked mentally counting from ten to ten all the way, and has arrived at a particular point. This to him is something very important!

Linear counting is not according to hierarchies; it is a path that we offer to the child to go on counting. We use a rosary when we say our prayers. It is a guide for us to follow mentally. If it is necessary for the adult, so much more is it for the child. When once the child has learned this technique of counting, then he has a period of groupings. He counts in twos or threes. He uses this process and gradually begins to count by 20s and 30s, with the same ease.

We have a special apparatus for this, in the same colour as the bars of beads. Here, there is no longer a hierarchy of the decimal system in form. The chains of the thousand and the hundred are made of golden beads. When the child counts by 4, he will have a card on which 4 is written. He can count by 4 or 8 or whatever number he wants and mark it on the chain. In counting by 2, 3 or 4, the colour of the cards will differ accordingly.

The child who is already aware of the geometric differences, can now make a comparative study of these differences between the squares and cubes of numbers. When the chain is stretched out one can see the comparative enormity of the growth between one step and another — for instance the cube of 9 and the cube of 8. The difference between the original quantities is only one, but the difference in the cubes is great. Thus besides skip counting, the child is able to sensorially study some of the differences between the square and the cube of numbers, and of what they represent in quantities. He is interested in finding out how the second power is called a square, and the third power a cube. We might say that linear counting and skip counting help the child to acquire better abstract mathematical concepts which help him when he begins to write afterwards.

CHAPTER 13

The imagination is that synthetic power of our mind which shows us things better than when we actually see them. The imagination depicts to our mind, not only pure inventions, but also real things. We must now build up in our imagination, not only the special physical characteristics of the child who is soft and round, who has very fine and curly hair, and tiny pearl-like teeth, who makes very graceful movements, not only the psychology of the child, not only the method of education suited to the child, but the complexity of his life. We must imagine his life not as if it were the beginning of life, but as if it forms a circle complete in itself.

First we must consider the child from the point of view of love. The child is loved and all the child's life is love. He blessedly wishes to be the centre of love, and he is utterly unselfish in this love. He does not care in what conditions of life he is born. He only needs people around him who love him. The child does not forget the love of all those with whom he has come into contact. He loves them too. Each one of them is of value; all of them have a place in his heart. Not only the people in the circle of his family, but also the animals in the house are loved and remembered. When one mother taught her child to pray she asked him to repeat — "God keep in life for this night, my mother, my father, my aunt, my ..." The child went on to mention all the members of his family, near and not near, the servants, and asked God to keep in life, the animals — even the little dog and the cat.

The child accepts and cherishes everything around his person. At this age, if he is offered a religious concept, it must be personified in some entity which has personal concern for the child, who looks upon all his actions with interest, who is happy if the child is well, who tries to help the child if he is unhappy or in ill-health.

The life of the child is however not limited to this. It has another part — his social life. From the family, from his home, the child comes into this enclosed and limited environment of our school[1]. Here he comes into contact with other children who do not belong to his family or home, but who share with him the new environment. This environment is prepared in such a way as to offer the child free activity. In this environment the child comes into contact with some objects upon which he concentrates. The special characteristic of this activity, which is a cycle of laborious work without rest is calm. Through this activity the child slowly builds up his personality and gradually acquires special characteristics. He become a serious person and learns to finish the activity which he has begun. He shows a very special ability to offer help when help is really needed, and to show respect for those who are occupied in an activity. He shows special sympathy and understanding for smaller children. He shows that kind of obedience which we might say, is a consent of the spirit to other people, and he acts according to the will of another in serenity and calmness. All these things may be considered as manifesta-

1. In many countries the Montessori school has come to be known as the *House of Children* or the *Children's House* or its equivalent in the local language. For the sake of continuity and convenience in this book we have used the terms "school" or "our schools" to indicate Montessori schools and the term "traditional schools" to indicate all other schools.

tions of love.

When the child spontaneously forms his ideas from the environment, when he concentrates upon some fact afforded to him by the environment, he does it with real passion. What we see in the child, when he obeys with joy, when he shows consent of the spirit to another person, whom he recognises as superior to himself, from whom he derives instruction and pleasure, when he obeys the will of the teacher, is also a form of love. In this sensitive period, he absorbs images and attaches himself to things. It is by his capacity for absorbing and attachment that he is able to conquer his language, and consolidate his character.

Besides these great and fundamental things, he also seems to attach himself to some things which are more superficial, but which seem to form part of an aesthetic whole — to beautiful colours for instance. He is glad to be well-dressed, he likes to be well-combed and well-groomed. He cleans all the things in the environment and puts them in order. He seems to like good manners, which are part of the superficial relations with the other people in the environment. He also shows delicacy in trying to achieve perfection in all of this.

In our schools, in the children's environment there is spontaneous discipline which is almost the solution to the problem of obedience. It is a mysterious solution. We try to offer the child freedom; when we offer true freedom, we get discipline! Order and discipline are the most visible things in this environment. The child when he is left free, instead of breaking everything, fighting or jumping around, is calm and serious about work. How many people have said to me time after time —"This is the ideal life! This is the kingdom of Heaven! This is the way men ought to live." How much pleasure did they derive in the vision of such a society, made of better and superior human beings. This picture of a small society, awakened in their hearts something which had fallen asleep — a kind of resurrection of childhood memories, because our best moments in life are in childhood.

Thus the child at this stage thinks — "I believe in a God for whom I am of special concern. He looks upon me every moment, none of my actions escape Him. I believe in other spiritual entities who are always near me in order to protect me. I feel an attachment towards all those whom I know. When I pray, I pray for all those whom I know — my friends, and even my animals. I leave the people at home to themselves, but try to help when they need it. I try to be kind to all the people I know. I try to be as courteous as possible. I like all the things that are beautiful — my home, works of art. I am a serious person. If I start a thing, I finish it, and repeat it every day with serenity. I also like to be beautiful. I am glad if the eyes of the people who see me find consolation in the sight. I have learned to do many things of a gentle nature. I know how to sing and dance. Though it is nothing serious, it is enough to be joyful in life, to experience the joy of living a simple life full of affection. I like to be part of the small circle of people in school who are happy to be together. I find companionship and consolation in their company. I like to be the centre of my home. I like it when people confide in me, and put their hope and faith in me."

This we might call a perfect optimism, a life of lofty sentiments. Perhaps we could not imagine anything more perfect than this. Indeed we might wish for society such a form of life! We must realise that this is the complete form of the life of infancy, the first form of childhood. Certainly it is beautiful because we have in the depth of our soul these first memories of childhood. We feel the call of this early childhood, which has formed us, which we have forgotten.

When I go into the streets of Madras, I sometimes look upon the people who as a form of rest, take not the sitting posture, not the lying down posture, but merely stoop down with their chin on their knees, leaning a little bit forward on their arms. Freud[1] said that we have only one real position of rest, the position that the embryo of the child took before birth. Every man needs everyday to take for sometime that position, because our rest is in our origin. This longing we feel for our origin, must be fulfilled in each period of our life.

This life of the early childhood, becomes the ideal of the life of the adult man. We must remember that while it is true that much of his early childhood remains, man is not made to be passive and to remain serenely within an enclosed environment. He can not limit society to the people with whom he comes into contact. He will be in need of the person who loves him, who has faith in him as a child. The efforts of man cannot be limited to occupying himself with his own appearance, or the welfare of his own people. Religion which touches us most closely, cannot be limited to having a God or an entity whose concern is man's person. Therefore this is not the end. It is only the first step and we must go forward. A child of seven years, asks himself — "What is good? What is bad?" This new concern, this new preoccupation is different from the earlier belief in the existence of a God whose concern he was. He now feels — "I must know what is good and what is bad. I want a teacher to enlighten me, to teach me what is good so that I may follow it." The mother when

1. Sigmund Freud (1856–1939) the founder of *Psychoanalysis*, was well known for his work *Die Traumdeutung* (The Interpretation of Dreams) published first in 1900. This book, which was an exploration of the unconscious mind, contained a great many discoveries and exerted a profound influence in every branch of thought, particularly science and education.

he is small seems to be the personification of beauty, goodness and virtue. The child feels — " Whatever my father does is good. My father is the most honest and most respectable man in the world. What he does is right and good. What I ask of God is enlightenment to show me what is good and what is bad. I ask Him for the personification of righteousness." This is another step.

From seven years onwards, his mind begins to seek a more ethical ideal than the seeking of God. He seeks it in a circle, wider than that which encloses the home. From this moment, a way is open to another form of life. We have already perceived the changes which the body of the child has undergone. All the graciousness of manners has departed, and the child has become rough and violent in his movement. He is a strong person, not soft or round. His little pearl-like teeth have changed for others which are very big, white and strong. Slowly, man goes forth until he reaches the last stage, carrying with him always the memories of early childhood. He feels the support of the people who love him, and believes in a God whose concern he is. The memories of early childhood, he carries along with him as he grows, like a snail, whose early shell always follows it. Growth augments the shell, but the important part of life undergoes a change, something else is added.

It is very interesting to make a study of the different ages[1] of the child; to see him develop, to understand the new needs that arise on account of his development, and to study the changes which must be brought into the environment in order to answer these needs. The child in this form of love, cannot be called an egotist, cannot be called selfish, for that is the form of his life. An adult who merely retains that form of psychology with all its perfection might with reason be called an egotist, a selfish man. As he grows,

1. For more details refer to a book by Dr. Montessori entitled *From Childhood to Adoelscence.*

he should not limit his life to the family around him, but find an environment which is always growing wider and wider.

CHAPTER 14

Although the path towards abstraction in the field of mathematics in our method is very slow, the child makes greater strides by this than by any other method. By no other method would a child of three have reached this point so quickly. First we give the child a square composed of real beads in which he could count all the hundred beads. Then the beads were only represented by circles in the square. Now we can offer the Stamp Game. The hierarchies are introduced here in the same symbolic colours as the cards — green, red and blue. The material consisting of long sheets of perforated stamps[1] is found in little books. In some of the books all the pages are units, other books contain tens, and still others contain hundreds and so on. Instead of the bars of ten, the squares of hundred and the cubes of thousand, here the child has something like promisory notes which do not really have values but only represent them.

From the psychological point of view, it is necessary to furnish a change of material so that the child can go on with the same activity. The development of the child is assured by his being active along a certain line. After the

1. Today instead of paper stamps we also use stamps cut out of hardboard. Besides being durable the material can also be used over and over again by many children. As it is easy for the child to count in rows, the loose stamps must be carefully arranged one below the other in the order of the hierarchies before the operation is begun.

bead material, by merely offering him these pieces of paper, we change the activity. Yet the child will repeat the same exercises, and assimilate them. The procedure is similar to that with the bead material. First he works without carrying and then with carrying. This is the first time that the child works at this activity alone. Instead of being a collective game, this is an individual one.

We represent the children by means of skittles in symbolic colours. The green skittles represent the units, the blue represent the tens and the red ones represent the hundreds. The operations are carried out only with the skittles, not with children as before. In a division sum, to divide 3626 by 128, we place the skittles according to their hierarchies, tear off the capital that we need from the stamp material, and distribute it to the skittles in proportion of their hierarchies. If the skittle representing a unit gets one, the skittle representing a ten gets ten and the skittle representing a hundred gets hundred. The hundred will get ten times more than what the ten gets. We must in this case, begin with the highest hierarchy the thousands. If we have only one hundred, we must change it into ten tens and distribute them equally, as division is the distribution of all the capital that we started with. We first give the child division with no remainder. Later, after he has worked out a few problems, we offer division with a remainder, telling the child that if any amount is left which cannot be distributed to all the skittles, nothing can be given to any of them, and must be kept as the remainder.

To do these activities with the stamp material, it is enough if the child knows how to count up to ten. It does not matter even if the child does not know linear counting, he can still do these exercises because they are based only on the decimal system. It is necessary for the child to do these exercises for a long time, to help him understand the mechanism of numbers clearly in his mind.

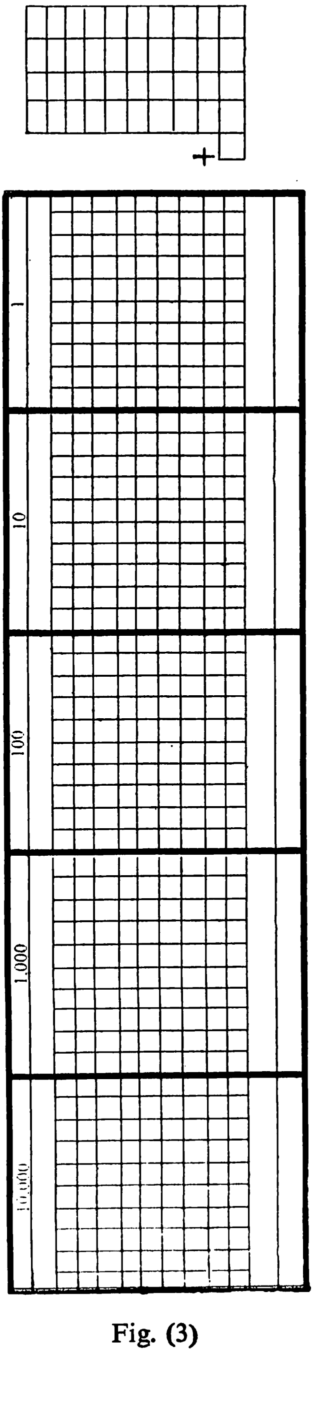


Fig. (3)

All the exercises done by the child simultaneously at the same age are called parallel exercises. These activities, may be indifferent subjects such as mathematics, and grammar, or in different branches of the same subject.

One such parallel exercise, which is presented after the Stamp Game but done along with the Stamp Game, is the Dot Game (Fig. 3), which is a further step towards abstraction. There are five columns on a paper, each column separated from the next by a thick black line. Each column (from the right) is marked with the unit, ten, hundred, thousand and ten thousand respectively, and contains ninety small squares. The size of the paper on which these columns are marked is the size of an exercise book. A small sheet of ground-glass is given to the child. The paper on which these columns are marked is placed underneath the glass so that the squares are visible. The ground-glass has a rough surface on one side so that the child can write on it.

The child is given the Dot Game at the age when he still cannot count more than ten. He is given a very long row of big numbers for the addition. He knows how to count upto ten, so he takes the unit in the first row of the big numbers and starts counting putting a dot in each small square in the unit column. When he has marked the number of units he puts a small cross where they stop. Then he marks the tens in the next column. The longer the addition sum, the more interesting it is for the child! After marking all the dots, the child starts counting the tens in each column, beginning with the units. We tell the child every time he finds a complete ten, he must put a symbol in the space left beneath each column. After marking all the complete tens, he must also put in symbols for the units which are less than ten. The symbols for the complete tens must be in a different colour from the units in order to distinguish them. The (dots) symbols for the complete tens are carried to the next column. When all the counting and carrying is complete, and the numbers less than ten have been written under every column, we get the result of the addition sum.

There is another simple game which is also played around the decimal system. The material must be presented clearly to the child in such a fashion as to make the game interesting. The child already knows the mechanism of adding, of carrying and the play of the quantities. However he does not know the sum, by heart, how much do 3 and 4, or 6 and 7 make. It is very hard to teach him this, because it must be acquired subconsciously. We must therefore teach him an interesting exercise so that he memorises the combinations while carrying it out, not realising that he is doing so.

The Snake Game, offers the child an interesting exercise. By repeating this activity the child learns subconsciously, without being aware of learning. The material for the Snake Game consists of a box containing forty-five bars of ten, a box of black and white bead bars, representing quantities from 1—9 (Fig. 4) and a box of coloured bead bars (red, green, pink, yellow and so on), containing ten[1] bars of each colour. We put a row of assorted coloured bead bars of great length. Sometimes the child forms the snake all over the room! We start to count the bead bars which form the snake. For instance if the first two bead bars in the row are 8 and 9, we count upto ten, and when we reach ten, we put a piece of paper after the second bead in the bar of 9 to indicate where the ten is completed. We substitute the ten which we have counted by a golden bead bar of ten. We then count what is left over on the bar of 9, and indicate the quantity left with the black and white bead bar of 7. So 9 and 8 are substituted by 10 and 7. The counted coloured bead bars 9 and 8 are put in a separate box. We continue counting the snake starting from the black and white bead bar of 7 to make another combination of ten and so on, until the row is completed and substituted by the golden bead bars of ten. The original snake disappears and a snake in the form of golden beads appears in its place. In the beginning when the child substitutes 7 and 6 he may call the new combination 10 and 3, but later on when he knows how to count he will say thirteen.

Fig. 4

There is a way of making still more combinations. When all the bead bars in the snake have been counted and substituted, they are gathered in the box. When they are counted, they have to correspond in number, to the golden bead bars. When we put together 7 and 3, or 5 and 5, or 6 and 4, to make 10 every time, it helps the child to memorise the combination. If we have made a mistake in counting, we must start all over again. The repetition

1. Today we have only five bars of each colour.

will help the child perfect his addition.[1]

The Snake Game, is so fascinating that the child may go on doing it even when he knows the combinations very well. Through this repetition, he begins to individualise the different numbers by the colour of the beads that compose them. When he takes a bar of green or pink beads, he does not count the number of beads, but says how much it is by the colour. He is able to say at once that 4 and 7 are equal to a ten and a one which is 11, instead of counting the beads one by one. When the child jumps to tens in this way, he has arrived at the moment of subconscious addition. It is not at this point that the child stops working with the Snake Game. It is at this point that he starts working with it. It is as though he has been given a key by means of which he can open the door to these sums, and become master of its elements.

Sometimes two or three children make sums going up to 2,000. In the end, the result is counted by the decimal system. Everytime they get a hundred, they put a square; if they get a thousand they put a cube. They see the final result of the sum in cubes, squares, tens and units. When the child counts such a big sum linearly, we must not only appreciate the patience of the child, but the enormous length the addition would be on paper.

In this first step towards memorisation, multiplication also comes through. At the end of the Snake Game, the child usually tries to combine the bars to form tens, which he pairs with the golden bars of ten. This helps him to see if the result he has arrived at is correct or incorrect. In the second step, the child no longer makes the combinations of tens with the bead bars, but separates the bead bars ac-

---

1. Today we offer this as a separate activity called the First Control of Error.

cording to the different colours, to see how many tens each group makes. For instance, he sees that five bars of 7 make three tens and a five. So he puts three tens and a bar of five together[1]. Thus the child comes to know the mnemonics of numbers, and is given a subconscious knowledge of these combinations — for instance, $5 \times 7 = (3 \times 10)+(1 \times 5) = 35$.

All the combinations of the subtractions must also be tied to such a mechanism, so we have what we call a Negative Snake Game, which will help the child learn the combinations of subtractions. In the Negative Snake Game we use bead bars of any colour in which the beads are not round but flat[2] so that they are easy to distinguish. The bars go from one to nine. We tell the child that he has to take away when he sees the negative bead bar. We start with coloured bead bars that go up to 30 or 35 before a negative bead bar is brought in. The procedure is the same as before. We must tell the child that he must change after every two bars. Even if the combination we are making is only 3 and 2, we must change without waiting for a ten.[3]

Now, while counting, 6 and 9 are placed as before in a little box, and a ten and a five are placed on the table to form the snake. Our idea is to make the memorisation of the numbers clear, and so we only reduce to ten. So for the next combination 9 and 7, we take out 10 and 6. When we get to the first negative part of the snake, it has to be taken away, from the bar immediately next to it. If it does not have sufficient beads a ten is taken in. For instance, if we have 9 and 6, when the child counts back he cannot

1. Today we offer this as a separate activity called the Second Control of Error.

2. During the first Montessori Course in India the flat grey square beads used for this activity earlier were not available so transparent octogonal beads were used as a substitute. Today the negative bead bars are made of round transparent beads.

3. Today we change only when we reach 10.

subtract 9 from 6 so he borrows from the ten bar he has already. So this ten is taken away from the box and the result of the subtraction which is 7 is substituted and placed in another box. This is an interesting exercise because the negative snake, unlike the positive one, does not grow. At the end there may be nothing left, yet, at the same time it helps the child in the memorisation of the combinations of the subtractions. The result of the sum, offers the child the first practical working of algebra. To prove the sum, and verify the result, the child can do same thing he did before — separate bead bars according to their colours into groups. Each of the negative bead bars can be paired with the positive ones. If they amount to the same, they cancel each other, thus proving the child's work. By this, the child acquires a subconscious knowledge of the combinations.

We can help the child become conscious of this knowledge, using another material — the Addition Strip Board. The board is divided horizontally into squares above which there are numbers upto 18. From 1 to 10 the numbers are written in red, and from 11 to 18 the numbers are written in blue. After 10 there is a board red line dividing the board vertically. There are eighteen wooden strips, nine are red and nine are blue. The first strip in each set is a square, equal to the squares on the board, on which the figure 1 is written, and the second strip is twice the size of the first one and the figure 2 is written on it to the right, and so on.

This board serves to make conscious and crystallise the subconscious knowledge that the child already has. We give to the child the addition sum in the combination chart, where he has to form the combinations of 5 and 1, and so on up to 5 and 9. First we use the blue strip of 5 and place it on the board in the space below the numbers written, so as to cover the first row of squares on the board. Then we take 1 from the red strips and place it next to the blue strip and read the result of the combination above the strip, on the board. The result is marked on the chart.

The child goes on in the same way with all the combinations, with all the columns. The Addition Strip Board tells the child how many units of the red are used in order to complete ten and how many are left. For instance, 5 when joined with 8 makes 13, and 3 is left over; so it is also 10 and 3. That is why the board is divided into the blue and red numbers, with the red line which breaks them.

Then there is another exercise. The child can take each number in succession and see how many combinations of this number can be formed. For instance, 9 the longest one of them all, is equal to 8 and 1. That is one combination. 7 and 2, 6 and 3, 5 and 4, 4 and 5, are equal all to 9. The blue strips taken first in the combinations will become successively shorter as the child goes from one combination to the next, and the red strips will become longer.

There is a confrontation chart[1] to verify if the combinations he has made are correct. After the child carries out these sums, he writes the results in a colour different from the numbers of the combination sums. This chart indicates the combinations that are necessary. The child memorises all these sums so we show him that certain combinations are just the repetition of the one or the other. So in the next chart we eliminate all those that are repeated. In the chart, in the first column, all the combinations up to 1 and 9 are there. In the second column, the combinations that we have included in the first are eliminated, and so on.

The Addition Chart presents all the results without the statement of the sum. Along the top and to the left are the numbers which are to be added up, and the result is found where the lines stretched from the two numbers meet. For instance, if we want to add 4 and 5, we take the column where 4 is written and go down and the result is where we meet the column from 5 horizontally. We give the child

1. Today, these charts that the children use to check their work, are called *Control Charts.*

a basket in which there are pieces of paper on which the sums are written. There are all the possible combinations. The child takes one sum looks at the chart, and writes down the result. By doing all the sums, all the combinations are fixed in his mind.

There is yet another chart on which there are only the combinations necessary for the child to know. Half of the numbers which repeat themselves, and have the same result are left out. If we want to add 2 and 9, we start at 2, and come down to 9, we get the result.

Yet another chart has only the combinations absolutely necessary for carrying out the addition sum. In this case, if we want to add 9 and 1, we jump from the two extreme numbers, and the result is found where they meet. Algebraically it is easy to express. The child is so interested in this, that he repeats it very often, and these combinations become further impressed in his mind.

We also have the Subtraction Strip Board[1]. It is the same board as we had for the addition, but the line is after 9, instead of after 10. The numbers go from 1 to 18, and the squares are there as in the Addition Strip Board. We have to find the numbers that subtracted from any of these, would give a result below 10, 9 being the biggest result. We must tell the child that no result bigger than 9, or smaller than zero is possible on this board. We have blank strips of wood, the same colour as the board. We cover up all the other numbers on the board, for instance down to 13, and from 13 we put 9 strips, 13 — 9 is 4, 13 — 8 is 5 and so on. We can see the result of the subtraction in the number on the board, just where the strip ends. Each of the numbers is

1. Today the Subtraction Strip Board is generally a greyish colour with a frame work of squares in blue. There are 18 squares horizontally and 12 squares vertically. Above the top row of squares the numbers are written 1—9 in blue 10—18 in red with a blue line running top to bottom after the number 9.

taken in succession, and all the combinations are arrived at progressively using the strips.

We can tell the child to find the numbers that when subtracted give a result below ten. That is why there is a blue line after the number 9. Each one of the subtractions must have a positive result which is below 10. So from 18, we cannot take away less than 9 in order that it may give a result less than 10.

There is also a chart for the subtraction[1]. If for instance we want to subtract 3 from 8, the result is 5 which can be found on the chart.

In these games, the intellectual mechanism of the repetition of the exercise is not a mecanism of learning, but of maturing. The child continues even after he knows the combinations by heart. The purpose of the exercises is not to learn the combinations but to help the inner organisation of his mind.

We must always remember that the secret of development is to keep alive the interest. The only way to achieve thorough knowledge is to keep alive this interest in the same item, presenting it in different forms, so that it can be totally absorbed. So these combinations of additions, subtractions and multiplications given each time in a different fashion, ensures the child's interest every time.

---

1. The Subtraction Chart is shaped like a parallelogram. On the top horizontal row from left to right are numbers 18—9 and continuing downwards diagonally from 9 are numbers 8 to 1. These are written in a red band. Along the left diagonal the squares are painted blue. They have numbers—9 to —1 written. The squares in between have the sequence from 9—0 written repeatedly from left to right.

CHAPTER 15

The preparation of the spirit of the teacher, is a vital part of our method, much more important than the explanation of our material. In our schools, the teacher must have an attitude different from the attitude of the teacher in a traditional school. In a traditional school, the teacher teaches, and the pupils sit together silently and listen. The teacher only gives tasks common to all. So the pupils are either passive while the teacher is active, or active according to the will of the teacher. The teacher in the traditional school is herself an authority, the immediate authority in the hierarchy of the authorities which are to weigh upon childhood. This authority has a certain power. The teacher feels herself to be someone, because once the school door is closed and she is alone with the pupils of the school, they must obey her.

Sometimes when the teacher has not in herself the necessary authority, means are given to help her. She is allowed to punish the children. There are certain hierarchies even among these punishments. Often punishments, are dealt out according to a sense of justice — for a particular mistake the child receives a particular punishment. These are innumberable. The punishments have no limits, so the teacher may even punish the whole class. Sometimes rewards are given to the child.However these prizes are awarded only once or twice a year. They only constitute a kind of distant vision, while punishments, are the daily ration. From these spring forth what we might term bad sentiments — competition, the vanity of those who win the prizes, subterfuge and the telling of untruths in order to escape punishment and a lack of willingness to help each other. This vision of things suggested to an English writer — perhaps it is an exaggeration — that school life is hell.

If we wish to become successful teachers in this new educational method, we must reconsider our task, and our personality as teachers. We must take upon ourselves the mission of bettering the condition of education. The main task is not to learn the method, but to open a new and better way of life for the child. Therefore it is necessary for the teacher to have an inner preparation.

The English poet who offered the definition of traditional schools, was a Christian. He had therefore the Christian idea of after life. Hell is a definitive landing point from which no one can get away. There is another place, a temporary plane, called Purgatory. This Purgatory is a place of pain in consolation. It is a place in which one becomes more pefect and achieves elevation towards a higher level, by continuous effort and by self-purification. Among those purifying themselves, is a higher spirit whose only task is that of pointing a finger at Heaven, the highest perfection, where one has yet to go. This is why the poet called our schools Purgatory and not Heaven. The highest spirit in Purgatory is the teacher who points out the way.

The teacher is thus the hope, the consolation, and the guide of the child who is trying to elevate himself. In order to realise this task allotted to her, the teacher finds herself in a more elevated place, a place really diffcult to be in. It is wise for the teacher who wishes to undertake this new task, of leading the child to a superior life, to realise the difficulties that she must meet. Sometimes, the teacher in our schools succeed very quickly and very easily. Very often she succeeds in practice, only after long experience. This depends upon the nature of her spirit. She may need a long period of training in order to change her spirit and give it another form. This comes with practice, contact with children, and experience. After all, the teacher needs to know for herself.

The teacher must have in front of her mind a picture of what is taking place in the environment. She must know that she is not supposed to do everything, that the journey of the child towards perfection does not depend on her direct action, but in the interaction of the child with the environment. In this environment there are certain sets of material which are used for certain exercises. The teacher must think — " My task is to place the child in a very close relation with these objects. When I have done that, I give the child into the care of these objects which will serve him as a mental and a spiritual gymnasium using which he will go forward towards perfection."

The teacher, although a master in the environment, is like a king whose highest ideal is to abdicate. Her glory is in being able to say — " These children can do without me." The teacher is a directing and guiding energy, she has a very clear mission — to be the saviour of souls. In a traditional school, often an inspector questions the pupils, who answer his questions correctly and quickly. Usually at the end of his interrogation, the inspector (probably not even looking at the children) turns to the teacher and says — " Congratulations, you have done well." This praise pleases the teachers in traditional schools. However, it is usually renounced by the teachers in our schools. When visitors come and see the good work of the children, they say — " Oh, how capable these small children are ! " Our teachers must be humble. Their highest ambition must be to be able to say — " Look, they do everything by themselves and I do nothing."

The teacher must achieve this aim, without punishments or prizes, by arousing the interest of the child. It is interest which urges the spirit to go forward, not punishment or prizes. This is a complete change of method. Upto a few years[1] ago, carriages with wheels drawn by horses or bullocks were used as means of transportation. The harder the animals pulled, the faster the carriages went. We could never at the time conceive of carriages without animals to pull them. Even though the carriage had wheels, it could not move by itself. Later, we understood that if there is a motor inside the carriage, it does not need horses or bullocks. It may be difficult to put this motor inside the carriage, it may cost a lot, but with the changing times this has been rendered possible. Similarly the times have brought a change in the means by which the child advances on the road of culture and intellectual development. After all the automobile can run even faster than a carriage pulled by ten horses! There must be such a rapid progress in the intellectual field as well. The teacher must then arrive at the point at which she says — " I no longer pull this mental cart." She must renounce being the means by which the child's intellect moves. Thus the child can achieve a far higher degree of progress, in which the teacher must cooperate. In order that the carriage must go without the horses, we cannot take away the horses and leave the carriage alone! The carriage will not go. The teacher must never forget this. Before detaching the horses, the motor must be put into the carriage. Before renouncing her royal posi-

1. Although the idea of a self-propelled vehicle dates back to the mid-15th century, cars began to be manufactured in Europe in the eighteen hundreds by Gottlieb Daimler and Carl Benz of Germany. Henry Ford revolutionised the manufacture of automobiles in 1908 with an assembly-line style of production. It was however only by the late nineteen twenties that cars were common place in modern industrial nations. In 1939 in India cars were yet not an item that people of modest income could afford.

tion she must kindle the interest of the child. Therefore the interests of the class is always alive in the teacher, who feels very deeply responsible for each child.

Once I met a person who people said was capable of reading thoughts. I was asked to think of something for him to do and follow him slowly to see if he would do it. I did not believe this at all. I followed this man, but what he did was entirely different from what I thought! All of a sudden, I thought to myself that I would really will him to do what I wanted. When I really willed it, my scepticism was gone. The man then went straight as an arrow to the place where I willed him to go! Children are very sensitive to the spirit of the teacher. The teacher may be a very good person who does not scold the child. However if on one day she is nervous, we see the whole class become nervous! This does not mean that the teacher should be a driving force, hypnotising the children by her will. Instead the children must feel a guiding energy in their midst. This is the first crown, we might say of the emperor, the will of the teacher to guide the child towards this finality, with the conviction that for the child this will be something great. The resolution of the teacher is — "I will never abandon this child even for a minute. I will leave him only when he has entered the path which he will be able to follow alone."

We have examined up to now the teacher as a directing energy. To keep the child within certain limits, she must offer the material to him, following a certain technique. So the teacher must have a direct communication with this material, and use it with the necessary exactitude. She must practice repeatedly in order to experiment and discover within herself the difference between using the material incorrectly and using it with exactness. To repeat these exercises is a sacrifice, for the teacher has no interest at all in repeating them with exactness, as many times as the child does. Perhaps the teacher will not have sufficient patience to repeat an exercise thirty times! Yet if the teacher makes the sacrifice for the psychological experiment, she can measure the strength of the child. Once she concentrates her attention on the material, by the thoughts that arise in her own mind, she may realise to some degree what sort of development occurs in the child's personality, by using the material.

Many of these exercises are mental tests. The Cylinder Blocks and the Pink Tower are used in certain tests[1] in schools of professional orientation and vocational guidance. However, the instruments that we offer the child are more perfect, more scientific than those which are given in these schools. For instance, in cities such as London and Paris where traffic is enormous, no autombile driving licenses are given to drivers of autobuses, and taxis unless they have under gone examinations from these institutions of guidance. The aim of using these exercises in professional institutions, is to test the construction of the person's hand and his co-ordination of movement.

Therefore, the teacher must make this sacrifice and do these exercises as self-tests, repeating them with patience as the child does. However her aim must not be to see how good she is at the exercise but to see how far she can go. She must try to penetrate into the spirit of the child and try to feel what the child would feel. The teacher should do these exercises as if she were going up a stair case, and try to imagine at each step what the child experiences at each stage of the exercise. She cannot be a king without pos-

---

1. Intelligence tests are puzzles or tasks used to try to categorise degrees of intelligence. In 1905 Alfred Binet devised the first successful test the Binet-Simon scale to help in identifying the mentally deficient pupils in Parisian schools. Subsequent developments included the Intelligence Quotient (IQ) group tests used to screen army recruits in World War I, and the Stanford-Binet scales. Modern tests are used for such purposes as predicting successes in schools, screening job applicants, identifying exceptional children and diagnosing the mentally disturbed.

sessing patience.

Besides the preparation of the environment and the material, and the successive presentation of the material, the inner, spritual preparation of the teacher is essential. This preparation is not something vague and abstract, but the way that the teacher must feel when she approaches the child. This preparation takes long to describe and even longer to achieve, because in order to achieve it, it is necessary for the teacher to exercise herself. For instance, the teacher must be able to distinguish between the formative activities of the child and his disorderly motor activities. She must be capable of making a distinction between the child who is inert because he is discouraged, and the child who is merely observing what the others are doing, who may be outwardly inert but is internally active through this observation.

Often in the beginning the poor teacher although full of good intentions and good will, does not understand anything. Sometimes such a teacher will set free disorderly action out of which a revolution may arise in her class. This teacher feeis the humiliation of her failure. She may also perhaps feel humiliated, when one day she sees a child who has done nothing at all for many days, who was left alone, all of a sudden get up and start doing things! The teacher has not taught the child, and therefore it comes as a surprise to her. This is because of her lack of understanding of what is going on in the child's soul. As the teacher represents the king, these events in her little kindom upset her as she does not know why they occur. The poor teacher feels inadequate; she feels she does not know how to teach by this method. The natural impulse of the teacher is to run to the help of the child. However by very strong recommendation, and the strong assertion of a very clear truth, she is told to do the most difficult thing — to refrain from giving erroneous help. If she interferes uselessly, she puts out a light. So by taking on the task of the teacher she finds herself in a mass of difficulties and responsibilities. In traditional schools it is much easier, because the teacher can tell the children what to do, and use her energy to make them follow her instructions. All the doors are closed. If at the end of the year, she has made a mistake, the inspector who comes looks around and passes over it. In our method however, there is a responsibility, which the conscience of an awakened teacher feels. The teacher must have the will to learn, and to sacrifice, so that she may succeed. She must feel — " Oh, I pray that I can refrain from useless intervention. I pray that I should not put out the flame in the soul of the child. I am ready if necessary, to tie myself to my chair to prevent myself from interfering uselessly."

To a teacher who comes from a traditional school the first thing we say is — " The way you treat children is absolutely wrong." This takes away any confidence that she has in herself. If the teacher is willing to learn, and it is demonstrated to her that she really does not know anything about children, she can neither be active or passive and she desperately asks — " Could you not give us a technique that will help us to respect, and educate a personality with a feeling of responsibility? " If the teacher has good intentions, and is not conscious of doing wrong, it is necessary to offer her encouragement.

Once, in order to offer some teachers this preparation, we decided that some of us should pretend to be children, and that those of us who remained adults would treat those who were children as adults usually treat children.

In normal life in the house when a child does something, we say — " Stop doing that, don't be silly! " Sometimes we ask — " How many lies have you told since yesterday? " When we like a child immensely, even if we are strangers to him we say — " Oh, what a nice little boy he is! " We even show our affection by putting a finger on his head and stroking his hair!

Let us imagine a husband and wife out for a walk. The husband meets his friend who does not know his wife. The friend asks — " Is this your wife? " The husband replies — " Oh, my wife! She is such a capricious person! She continuously falls into all sorts of trantrums. She is so naughty. She eats too much and complains of tummy pain and I have to give her medicine! " We would consider the husband's words inappropriate, yet we talk so of children, even our own children! When someone socially superior comes to our house, sometimes we present the child and say— " You see, this boy has a very narrow chest. He is disposed to tuberculosis. His eyes are not so good, and his tonsils are swollen. They have to be taken out. He is not very intelligent. In fact he is a bit stupid! " This is the way we introduce the child to a total stranger!

If we carry on this pretence for just one week, it will be a very hard week for both the adult who is treated as a child, and the adult who remains an adult. We must realise howe-ever, that if in pretence the erroneous treatment is difficult to accept, it lasts only for a week. For the child, it is not a week or a month or even a year, he is treated this way his whole life as a child.

We can also give ourselves a trial that we call the day of penance, representing the day of the child in school. We arrange for someone to come to the school in the morn-ing, who in a language absolutely incomprehensible to us, talks for about three hours. During these three hours, we must not budge, we must pay all the attention that we are capable of to what the person says. Our fingers and arms must not move' We must simply sit quiet and listen. If for a moment our eyes become cloudy and reveal that our mind is somewhere else, the person who is talking asks — " What did I say ? Repeat what I said ! " If we cannot, we face dire consequences. After our meals, although we are tired we come back, and the same treatment continues for another three hours. It is difficult for us to stand this sort of treatment for one day. Think then about the child who undergoes this every day of his life; not only as a child, not only as a boy, but even as a young man.

This pretence is a technique of spiritual preparation for the teacher, a preparation in which she herself is the material. While acting as a child, the teacher feels more or less humiliated, because she does not know how to deal with things. During this difficult preparation she also realises through experience, the harm done to the child through erroneous treatment.

The teacher must have faith — that the child will become calm, that the child is good and not bad, that the child will one day do marvellous things. If the teacher has no faith, she must make an effort to repeat to herself — " Yes, here is the truth. I believe in it! " Then the blessed day will come — the child will shed these deviations, and will lose his defects, his disorderly activities and apathy, and revela his love for his work. Perhaps not all children will be transformed. Perhaps, it will be just one, like a light to guide the teacher and to give her faith. Her eyes will then penetrate into the soul of the child and be consoled. Thus a new life begins. The teacher, when she finds herself trying to help the child draws back thinking — " I must not interfere. I must not give the child useless help ! I have arrived at this point after so much suffering. I must now be as one who does not exist." If the child does need something, the teacher remembers — " Yes, this is the time to offer this new item of knowledge. I must offer it with exactness." She also remembers at what age the parallel exercises are to be offered to the child. If she cannot remember she will search in her material book with anxiety and concern to recall what she has forgotten.

As the teacher follows her stormy path she will see the child accomplish his work, repeating the same thing over and over again with the same exactness, at the same speed, until she feels like saying — " I wish he would go on and do something else! " However, gradually the teacher senses something new, a glimmering hope and she feels — " I must have the patience which the child is capable of. I must wait!"

The teacher begins to see that children do things that cause her surprise, that are far beyond what she imagines, perhaps in a different fashion than she expected. This is a valid experience, an experience led by the teacher's own consciousness. The child's progress is not due to the merit of the teacher, but the result of the inner development of the child. The teacher may have heard this truth and even learned it by heart. Yet it is quite different to have heard it spoken of as a phenomenon and quite another to have it happen in front of her eyes. It is perhaps like hearing about the blue sea — a sheet of water which is continuously moving, which gives much pleasure when dipped into at sunrise ! We may have heard of it and seen pictures of it, and heard how our friends felt when they bathed in it. Yet it is quite different when we see it for the first time, and enter its waters. We feel something we cannot describe, that we have not learnt from descriptions. It is our own experience, our own joy. When the teacher sees the child suddenly shed disorderly actions, realise his own intelligence, and become a serious little man, she feels a great emotion that no one who has not had this experience can feel. Many delicate touches, that she did not even suspect to exist, spring forth from the soul of the child and are revealed by his actions.

Suddenly the teacher who dreaded going to school in the morning, now runs forth to arrive quicker, so as to be there when the children arrive, to see what new phenomena are to take place that day. Perhaps now the children also hurry towards the school, to arrive early and start working, or to wait for the teacher. Thus there is a new love, a new thrill in the work and a loving spirit, as the interest of both the teacher and the children is elevated. Often, once the school is closed, the teacher remains there hours together, without pay, with only reprimands from the government,[1] just to think out what to prepare for the day after, in order to find new lessons, new food for the soul of the child. We do not know if the teacher does this for the new child which she has seen revealed before her eyes, or if she does it for her own self. For the teacher, this experience is as refreshing as a walk in a lovely place, or the fresh air on top of a mountain, or the peaceful solitude of the woods. Indeed, she feels the elevation of her soul; she feels closer to God. The teacher has disocvered a divine place, which was earlier covered by a blanket of darkness and error.

To discover the soul of the child, it is necessary for the teacher first of all to cure the child of his deviations. She must then lead him on a path of development with positive help giving him the necessary apparatus. Still more interesting is what happens to this teacher. The teacher, so full of self-importance, so ignorant, violent and crude, who unknowingly puts out the light of the life of the child, thinking she was offering him knowledge, suddenly acquires good-will and a soul detached from self. She even carries out exercises in quest of her faith. She is ready to make sacrifices in order to believe in the child. She becomes humble of spirit. Doing exercises with patience, she becomes a creature of the woods, of the forests, a part of a soul which has to bring forth a new form of life.

---

1. In the original manuscript, Dr. Montessori mentions how the Italian Government insisted that the stipulated hours of work of the teacher be respected, and that the school be closed on time. Indeed even today there are similar reports from certain countries in which to protect the rights of both the children and the teachers Montessori schools have been asked to shorten their hours of work.

Thus the new life, is not limited only to the child. The teacher must also possess it. So, the great discovery is that the teacher is also capable of undergoing a change with the help of the child. These changes in the souls of the teacher has often led to great changes in her life. Many teachers have left off the things that seemed of importance to them. Many of them cried and said — "It is impossible for us to go back to the old methods. We could never teach in the old way again. We cannot even conceive of the child in the old way any more !"

This is really the co-operation between the soul of the child and the soul of the teacher. Both souls are now free, both have reached the same peak. The child is grateful to the teacher. The teacher looks upon herself and recognises the new being she has become, and asks herself — "To whom do I owe this ? Must I not be grateful to the child ? After all which of us is the teacher ?" So the word *teacher*, rises farther aloft to become a unity, which is the master and the teacher of all.

CHAPTER 16

Language is a complex subject which has been analysed by humanity into different parts. How we consider it in our schools is significant. We help the child both directly and indirectly. The indirect preparation is offered through those exercises which help the child acquire the co-ordination of movement to hold a pencil — by going around an enclosed figure, and the exercises for acquiring the lightness of touch necessary for writing. This is the indirect preparation of the human hand for writing. The direct preparation is offered through the use of the pencil with the Drawing Insets, the tracing of the sandpaper letters with his fingers. We also offer the child indirect preparation through the intellectual activities of recognising the sound corresponding to each letter, the analysing of the words that the child possesses into sounds, and the outer expression of this analysis by the Movable Alphabet. When the child has done all these, he is potentially ready to write. Writing comes as a natural consequence when the natural process has been completed, as an explosion of joyous activity.

At such a stage, the child will take a piece of chalk or a coloured pencil, and start writing. Sometimes he writes words, and sometimes he writes a whole sentence. Only those who have witnessed this phenomenon can understand the significance of this wonderful achievement, and the difference that it makes to the soul of the child. The excitement and joy produced by being able to express his thoughts through words, is very great. It is as though the child had made a wonderful discovery, as though he had invented writing himself. With excitement on his face, he goes around telling everybody that he meets — " I can write, I can write ! " In the school, the child who may never have seen the teacher write may go to her and ask — " Can you write ? I can write ! "

When one child has started to write, all of a sudden, another discovers that he can also write and all of them at that age begin to write. There is no stopping this writing. We furnish them with paper of course, but the children write everywhere. Sometimes, when they are walking home, they may stop in the middle of the street and begin to write with a piece of chalk or pencil that they have taken from the school. Such is their craze! Only a person who has had a problem bothering his head, with the solution ready to come out, who has then all of a sudden acquired a new insight into something, can imagine this activity of the child.

What is important is this interest, this spiritual life of the child which is the motor in this activity as in all other activities. This first writing of the child must be treasured as a precious thing, and should be received by the teacher with the enthusiasm and the joy that it deserves, the joy of one who loves. In seeing the goal achieved, she expresses an admiration for this great thing, which to others may look a bad scrawl. The teacher must feel the admiration for this feat of the child. At this stage, any errors in spelling that the child may have made are irrelevant. Correction of errors will kill joy and interest. The teacher must instead cultivate it by giving the spiritual response to the spiritual explosion in the child.

The study of language will come later on, when the newness of the activity has passed. When he has done the activity for some time, he begins to be interested in all the details. It is then that the details of spelling and the study of a language are given. A similar process is followed in the spoken language.

There is a period of preparation for the process of reading, to which there are three aspects. The first is the correction of pronunciation. If the child has defective pronunciation, he is able to make the correction, if he pronounces the words in front of a loud speaker. This is easy when the child is under three, for this is still the formative period of the language. The possibility of correction of the pronunciation goes on until the child is five to seven years of age. When the child starts with the Movable Alphabet, he can be made to realise any imperfection of pronunciation that he may have. The defects may be pointed out to the child, by the isolation of the sounds with the sandpaper letters. Of course, the correction is always in our usual way. The teacher does not tell the child that he is not pronouncing correctly, but simply pronounces the word correctly and asks the child to pronounce it as she does.

The second aspect of the preparation has to do with the patrimony of words that the child possesses. We must offer the child the correct use of words. Sometimes the child uses words that have a similar meaning incorrectly. For instance, the words *thick* and *fat*, have a more or less similar meaning and he uses these words one instead of the other. The child does not know how to read and yet he has gone through lessons distinguishing between thin, thick, fat, tall, long, short and also all the lessons dealing with the names or the qualities of objects. After the child knows how to read, when he is studying the use of words and grammar, words that have a very similar meaning are offered to him, in order to explain the exact meaning of words. This patrimony of words must be made larger, by introducing new words to the child by means of objects and pictures. These are usually given in studies which will be carried out later by the child, such as geography, geometry, natural science, physics, chemistry and so on. This mus be done before he knows how to read. The child's writing is based on the first sensorial experiences he had. The correct scientific terms are given to the child, as means of a sensorial classification of things.

The third aspect which also comes before the child knows how to read, is self-expression. The teacher must encourage the child to talk. Usually the child is a bit shy to speak when he comes to school. He is not shy by nature but by repression. The child has the instinct of speech, however his language cannot be as logical as ours. He forms some simple ideas from what he sees around him, from what strikes his intelligence. He expresses these in words. Often people say — "Do not say silly things!" So this natural outpouring of the child, which if not repressed would be the spontaneous development of speech, is almost always crushed by the adult.

Traditional schools, form debating societies when the children are sixteen years old, in order to develop this power of speaking which has been previously crushed. The need which has been felt for the creation of these debating societies shows how much difficulty we experience in speaking. To speak in public can be torture. A person may prepare himself beautifully and arrange his thoughts and ideas clearly, but when he finds the eyes of the people sitting before him, staring at him, he becomes paralysed. He tries to get over it with a stupid smile, but cannot talk. If in the middle of his speech, somebody asks something, he cannot retort, but when he goes home, the answer that he ought to have given is obvious although he could not say a word to the person who interrupted him. In fact he should not have found any such difficulty. He should have been able to express himself absolutely freely, even with many persons listening to him. These are the results of childhood. This kind of created shyness in his personality may not have developed if as a child he had been given the motives of activity in order to develop co-ordination of movement for the power of speech.

People, when they are asked to speak, will generally group themselves into three types. One type of person is eager to talk. He spontaneously speaks in a natural and excited fashion. Another type of person seems to know more than the one who speaks. When the person who speaks makes an error, he immediately corrects the speaker. If asked to tell the story himself however, he will not say a word, or what he says will be more incoherent than the person who spoke first. It is like a person watching a dancer do an exercise, who can recognise the mistakes that she makes with her feet and arms, but who if he had to get on the stage, could not dance at all! There is also another type of personwho gets up, not to talk, but to merely shake his head.

Eventually all these three types have to become one type, one who knows how to express himself correctly, without shyness and in a natural fashion. For this the children need practice. This encouragement can be given in many ways with a scientific basis, with the idea that something is to come later.

When the children come to school, we tell them stories. We can ask some of the children to tell us some story in his own words, or later on, when he has acquired some confidence, to tell us what he has done[1] during the day at home or about a walk in the garden.

Among the activities we offer the child to encourage him to express himself are oral games. We have one which is usually done during the lunch time when the teacher is partaking of lunch with the children. The teacher comments on something which has happened. For instance,

---

1. Today we call this activity the News Period.

when the cook[1] brings the soup, she says — *The cook has brought the soup.* Then the teacher asks — *What has the cook brought?* The children say — *The cook has brought the soup.* Children between three and three and a half years like this game[2] immensely. In this way we construct the mental mechanism which is necessary when they are seven years old to analyse sentences — to pick out the subject, predicate and the other complements. For instance, we can take the sentence — *Mother has gone in the car to buy a hat.* The child begins to ask—*Where has mother gone? Why has mother gone? In what has mother gone?* In the end, the child knows the why, what and where of every sentence. So even before he knows how to read and write, this mechanism so necessary for the later study of the grammatical construction and analysis of sentences is laid out in the child's mental personality.

There is a connection between the written language and the spoken language. The written language puts the child into communication with the thoughts expressed by other people without any sound — a communication from soul to soul, secrets told without even a whisper, a personal communication of thoughts which nobody else can hear. In this respect reading has a high spiritual value.

In our schools we recognise three different kinds of reading — mechanical reading, interpretive reading and reading aloud. Mechanical reading is the ability to recognise the sounds indicated by the alphabetical letters without any thought about the meaning of the words, merely a kind of mechanical phonography of the words in the mind. It is a kind of mental typewriter. As we touch the key on the typewriter which has the letter, it is printed on the page. Here when we recognise the letter our mouth starts to produce

1. The word used in the original manuscript is *servant.* It has been replaced here as it is no longer acceptable today.

2. Today we call this activity the Question Game.

the sounds.

Interpretive reading, is the ability to understand the sentence and to make sense of what is said. In this case our mind merely listens. It does not have to reproduce the sounds used. It is as though we are listening to a speech without using our ears. We use our eyes to hear this speech! People in the libraries do not take a book and read it aloud. They do interpretive reading.

The interpretive reading in our schools is active, dynamic reading. The child has a series of cards on which the names of objects are written, and a series of objects. He puts the card with the name of the object written on it next to the object. The child, can also read a slip of paper which is given to him, and receive a command to do something. The slip of paper might contain the words — *Go and open the door*. The child obeys this silent command. The action of the child tells the teacher whether the child knows how to read correctly and well. If the child puts the wrong card next to the object, or if the child does something other than the command, the mistake will be visible and the teacher will know whether the child can read or not.

When a person tells an interesting story we see his expression changing, and his voice changing. It is the play of his whole personality which holds the interest of the people listening to him. If we ask the same person, who can express himself so well, to read aloud from a book, we find that his voice does not change, his expression does not change. The people who are listening to him, go to sleep! The art of reading aloud is an accomplishment which needs some exercise. It is not the mechanical mumbling of words which are printed in the book. The reader must see the words with the sentiments of another soul. A part of his intelligence must take in the words and send them to another part which must reproduce them. Therefore, the eye must run more quickly than the tongue, and the memory must retain what the eye has already left. While the eye is taking the impression of other words, the work of the memory is to retain the words which the tongue has to speak. This is very difficult. Before the reader can put any expression into his reading, he must be able to understand the thought expressed by the words. The thought is not his own, and cannot be understood until he has finished reading the whole sentence. His eyes must finish reading the sentence while his tongue is saying the first few words. That is why actors who have made a special study of this are called good readers.

In traditional schools the child is usually given the most difficult part first. First he is asked to read aloud. The teacher asks — " How do we know that the child knows how to read, if he does not read aloud ? " If we realise how difficult it is for us to read aloud, we must know how much more difficult it is for the child to read aloud. After he has read a sentence, the teacher asks him what he has read!

To help the child achieve the third kind of reading, in one of the commands that the child receives, there is a sentence included which the child must say aloud. For instance, it may be a sentence like this — *The child went up to his brother and asked — " Are you going home today to eat?"* This is an indirect preparation for reading aloud. In order for the child to read aloud he must know the thoughts which he must express in words. The next step is to make the child read silently first, and then ask him to read it aloud. By then he would have been able to catch the spirit of the person who has spoken in the book. The last step is, without reading silently at first, to start reading aloud straight away. This happens when the child is around seven years of age, although the child starts reading at the age of five years.

There are three aspects to the study of language. The first one is the physiology of language. It shows us the function of each part of speech. The next is the skeleton of language. If we try to construct the human body, without knowing how it is built we may put the leg on top of the head! This is also for the formation of correct sentences. The third aspect is classification, the names of these different parts of speech.

When the child has a general idea of an object called a book, we may go with him into a library where there is only one red book among many other books. When we say — *the red book*, we refer to that book which has the quality of redness. That is one of the functions of the adjective — to describe the object named by the noun. We may say — *a blue bottle*, to distinguish it from all other bottles, among which one might be a big one, and another small. This is a group of words in which there is an article, a noun and an adjective. This is the physiology of the language, the functions of the different parts of speech. We may say — *I stand.* We may say — *I stand here.* There is a difference between the two. The second shows a relative place in which the action was carried out. One of the functions of the adverb is that of showing in a better fashion how or where the action is carried out.

When the child uses the language he needs to know which part of a sentence comes first and which comes after. For instance, consider the sentence — *John ate the bird.* We can say instead — *The bird ate John.* The function of the words is the same, but the meaning is different. We can say — *I wish to read a blue book.* We cannot however say — *I a blue wish to read book.* We have to study the construction of the language, and the correct place that each word should occupy in order to give the clearest sense. We say therefore that the child must understand the skeleton of the language. He must understand its structures.

While we study the functions of the different parts of speech, we must also learn their names. This is the classification. We have a grammatical box in which there are sentences which the child has to put together. Each word of this sentence is written on a small separate card. Each one of these cards is in a different compartment in the box. On each of the compartments in which the words are, the name of the part of speech that corresponds to the word is written. The child recognises to what part of speech a word belongs, when he takes the cards out from the different compartments to reconstruct the sentence.

Another analytical part of the study of the language is sentence analysis. We say — *I went to town.* The sentence is built around the verb *went.* We may ask — *Who went to town*? We may ask — *Where did I go*? We find that it is always the verb which is at the centre of everything. The verb usually determines what, where and so forth. Only very few parts which answer the questions (adjectives or the nouns) do not refer to the verb. For instance, we say — *The brown cock ate the white wheat.* When we ask — *Who ate the wheat*? The answer is — *It is the cock.* These words refer to the cock, and not to eating. We may ask — *Which wheat*? The answer is — *The white wheat.* The word *white* does not refer to the eating but to the *wheat.*

We can study composition and how to write a story. We can study paragraphs in order to understand which sentence should come first and which afterwards in order to make good reading.

Some of the special symbols[1] we use in such studies are the red circle which represents the verb, the black triangle which stands for the noun and another smaller blue triangle for the article. After we have made such a study, we can compare the styles of an Indian writer and an Italian writer without knowing either language! We can see at a glance if a writing is heavy or not. When we analyse the sentences with the symbols, we find that a long description has a stream of nouns and adjectives and very few verbs. Instead,

1. More about the use of grammar symbols can be found in *The Advanced Montessori Method Vol. II.*

if we take a piece of interesting and light reading, we find a large number of verbs. This is why books containing fewer verbs and more adjectives and nouns are dry. Thus we can also carry out a study of style through a study with symbols.

CHAPTER 17

Although the education of the child between three and six years of age is important, nevertheless, it is wise and certainly useful to have an idea of how to conceive of education in the other phases of life. The education of the child between the age of three and six involves exact techniques. In our experience with the child, we find a certain lesson for adults, for our social orientation. So we must have an idea as to what is to follow in the next period, because later education has some roots that penetrate into this earlier period of life. It is necessary not only to learn about the technique of teaching but also to gather some general ideas about education which may be useful in planning for the child, the different levels of education.

We have considered in the education of small children three main topics. One of them is the education of the senses. Another is the building up of the intellect through the study of language, by learning to read and write. The third is the learning of arithmetic. We must consider these three things as one whole, thus uniting the education of the intellect, with the education of the personality. In the course of development, the mind reaches a stage in which it begins to penetrate into the knowledge of external things. With the development of the personality, the individual becomes gradually more full of knowledge. Along with the development of knowledge, it is necessary to develop his language, to acquire more words, and to understand more complex forms of speech. His language must become more perfect. The knowledge of mathematics must also be developed so that he may understand the continuation of the instruction in education. He cannot develop knowledge if he does not help the mind to understand mathematics. So mathematics and language develop along parallel lines, along with the rest of the culture taken in from outside. Study in itself, does not really exist, as conceived in traditional schools. If we study by separating the subjects, each item becomes a burden to carry in our mind. Each of us is a complete unit. If we develop our personality, necessarily we develop our mind. So in our schools both mathematics and language are assimilated together and form part of the intellectual food necessary to develop the personality, and to aid development.

When we study geography, botany or zoology, with the study of each subject we acquire words that are new. Later on, when they are no longer new, they form part of the intellectual capital of words which augments the fund of words that are already at our disposal. Gradually as we undergo this experience, we become capable of understanding books which we could not understand before. This happens continuously. Therefore we must develop language along with any other side of culture that we may acquire. Instead of thinking of the words used in the different items of language as separate items, acquiring some at a particular age and others at another age, we must understand that they all form part of language as a whole.

It is a fact that no matter what subject we talk about, we need the knowledge of language and mathematics. For instance, we say that the equator is 40 million metres long! So in the study of geography, we use mathematics, as we must have an idea of this large number. Instead of saying that the equator is very long, we give the precise length. As the study of geography advances, we see that descriptive language is no longer sufficient, it becomes necessary to know another subject — arithmetic. Only with such knowledge will we be able to speak about the distances between the earth and the stars, the depths of the ocean, and the height of the mountains.

Once, when a group of people curiously asked an Italian General, the first man to have taken aerial photographs of the city of Rome, how he had done it, he began to speak of angles, measurements and corrections! The people who had asked him the question did not understand anything he said. It was completely different from what they knew about photography. They said — " This is not photography as we understand it. In order to understand what he means we must take a course in mathematics ! "

While taking a sea voyage, if we ask the navigating officer to explain how the Mariner's Compass is used, he will tell us about trigonometry and triangulation which we do not understand at all. Understanding the language is not difficult, but understanding the mathematical concepts is difficult. So it is necessary to have this mental formation as a base in order to understand what is happening in the world today.

Many of us have to recognise the fact that we are illitetrate when it comes to mathematics. We must realise that it is essential to understand mathematics in order to acquire culture. The knowledge of mathematics is as necessary today as the knowledge of the alphabet in olden times. The development of the knowledge of mathematics from the earliest stage is thus a necessary step in order to bring the child towards culture. In our schools we consider language and mathematics as a series of mental exercises which develop the personality in such a way as to render the child capable of acquiring this culture. Instead of treating them as two separate subjects, we tackle them in such a fashion that they are continuously penetrating into the mind, and growing with the personality, whatever be the subject that is studied. In geography, we find written language and mathematics, as also in physics and chemistry. There are a great many exercises in mathematics, and also a great many exercises in language. We develop mathematics and language together for the development of knowledge as a whole.

These subjects pose a problem in traditional schools. The teachers do not know what they should teach in the first grade, in the second and in the third! A little bit of geography for small children they feel will not be harmful. A little bit of history will also not be too difficult. Certainly no physics and chemistry for small children! These will have to be taught much later, certainly after the elementary school stage. They may teach a little bit of botany and zoology in the third grade, but reserve mineralogy, a very arid subject, for university studies.

While teaching geography, they deal with a small country first, and then a big country. First we study the town where we live, and then other towns are studied one by one. In the first grade, we teach the geography of our own country. Then in the second grade we may go on to other bigger and more distant countries. Something small is easy to start with. If some plan, more or less parallel were followed in history, we could give the names of famous men. The teachers say — " Well, the head of the child is poorly developed. His mental power is little. Therefore let us teach him small things. As the child grows bigger, we can teach more difficult subjects." It is with the same reasoning that the teaching of arithmetic is set up in traditional schools. In the first grade the child is taught to count up to 20. Now, after we have studied the psychology of the child, we know that this is one of the most difficult aspects in the study of mathematics. In the second grade, he is taught upto 100 and then in the third grade, up to 1,000. All the criteria for the acquisition of knowledge are based upon the same kind of reasoning. This kind of logical reasoning divides each item of culture and isolates it from the other. There is no unity between one subject and the other.

Now, let us substitute this idea with another. We must begin with the whole, instead of with certain parts. The vision of the whole is interesting, to the child. It is interesting because it is a whole, and can be easily seen. This unit, this greatness, is taken in with the maximum power of the child's mind with his imagination. Then gradually, the whole is interesting, he wishes to know its parts. The greater his interest, the greater his need to know the details. Then he begins to sort through the details in order to acquire the knowledge of the finer details. The study of each detail, each small item is of great importance and helps us to determine and to understand better the whole interesting vision.

Therefore, it is necessary to first create intellectual interest. In order to be of interest, what we offer must always be great. From this interest springs the development and acquisition of knowledge in all the different subjects. This is seen in the teaching of arithmetic. In my time, when I was in the first grade I did only addition sums. In the second grade I did subtraction, and in the third grade, multiplication. I had reached the fourth grade before coming into touch with division! The study of real culture however, begins with the decimal system, and by means of it we go immediately to the large numbers which arouses the child's interest. By knowing merely how to count up to ten, the child can carry out the four operations. This ability of the child is interesting, as it is relatively very late that his mind learns linear counting, and the combinations of numbers between 10 and 20. The acquisition of the mechanism of the four operations and the exercises upon all the small details become more and more numerous. It is as if the child crumbles the whole, and studies the crumbs of that which was in the beginning a whole in itself.

In the progress of things other than education, the whole organisation comes first, and then we go into small details. In order to create a Centre of Montessori Studies we must begin by making a general plan — the conception of the whole scheme. In order to realise what is planned, we go into the details. We must find a building to house the organisation, and then seek the furniture and persons to function in that building. Next, we must find the children for instruction, and decide how many hours of work have to be allotted in the school. Then come all the smaller details — how many pencils and sharpeners are to be supplied. We always start with a synthesis, something which gives a general idea of everything. It must be persuasive and appealing to the mind. This is the beginning. This plan must be given in such a way as to give a clear vision of the whole in a brief form. The same reasoning must be applied to culture. We must give a general picture, which catches the imagination and arouses the interest.

In traditional schools teachers when faced with this problem say — " I will try and give an idea of life." However life is only one item of the whole, not the whole. Every thing is everything. All is all. In nature, there is everything. It is something to be able to understand creation. How did the earth come into being? Why is it as it is? What is the task of man in creation? What is the environment in which he must live? In a general way, we can say that man lives on the earth, not in the air or in the water. This earth is ruled by something, something which always exists. Immediately these things excite the child's interest and enthusiasm. Then we can think of the tasks of all the animals upon the earth. Where do they live and what do they do? All these small details are necessary in order to understand the great facts of nature. More than nature and mankind there is naught in the world to be learned.

We may ask — " Does not man form part of nature? " When we say nature, we mean the whole. In this whole there are two great divisions — nature and man. We must undertake to study these two great divisions as natural sciences and history. In this way we present first the whole and then the divisons to a child between three and seven years. In our schools this knowledge is subdivided, and given to the child at different times in a way which is appealing to the child in his particular period of development. If we are able to understand this concept, our task of giving this knowledge to the child becomes easy.

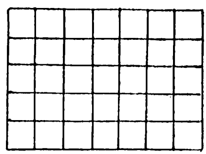
Living beings exist in water and on the earth. All the living beings that are upon the earth are spread upon its surface. Some of them may take little flights, but sooner or later they come back to the surface of the earth. The atmosphere is empty of life. It is not a place of residence for any living being. In the water, at all its different levels, there are myriads of forms of life. The ocean, from the floor to the surface, is full of living beings. There are even flying fish that for some time leave their natural element! Even the surface of the water is full of life. To compare the number of animals that live upon the earth with the number of living beings that live in the ocean, we need the knowledge of numbers and statistics. In both the earth and the sea, there is an immense quantity, an immense variety of living beings. Immediately mathematics must come to our aid in forming the idea of the comparison of the numbers of forms of life. To discover how old this earth is, we have to come again to mathematics. We express the age of the earth only in terms of numbers.

Let us consider these two elements — air and water Each living being upon the earth and in the water, breathes. Fish while breathing, take in an enormous quantity of water continuously. Living beings upon the earth take in an enormous quantity of air continuously and breathe without stopping even for a moment. In order to be able to live, the thousands of millions of living beings that are upon the earth, are in need of pure air. The air in order to be suitable for life must be constituted in a special proportion. If the proportion is altered a little, it would become poisonous, and every being upon the earth that breathes it would be dead. Yet how peacefully we live without thinking that at any instant we could all be exterminated! We do not go about all the time thinking that we are in danger. Each time any living creature breathes out it poisons the atmosphere. Yet somehow the air is kept pure, in spite of the poison being poured into it continuously. Who preserves the purity of the air? If the seawater is altered by one degree of its components, the salts would kill the fish in the sea. Who keeps the water at that constant level of purity for the living beings in the sea? After all there are innumerable rivers that deplete the land of salts, which empty themselves into the sea. These poisonous substances have polluted the atmosphere and the sea for millions and millions of years, and yet the constitutents of the air and water have not altered a bit. Why is it so? We must think about evolution and its marvels. Certainly it is a marvellous thing. We make evolution. That is life. Life is but an atom of the whole. No matter what part we consider, it is only one small item. The whole can only be understood by some entity above the whole. The small particulars and the little details are but items that will serve as an introduction to this whole which is creation.

CHAPTER 18

In our schools, the different triangles which make different geometrical figures when they are put together, are given to the child at around three years of age. In this first group, two triangles when placed together form a figure. In order to guide the child to place them together correctly, a dark line is marked on the edge of each of them where they meet. When they are joined together in this way, they make a particular figure. There are as many different pairs of coloured triangles as there are different geometrical figures. If there are no lines on the two edges of the two triangles, they will form quite a different figure. It is necessary to give a child of three years, a very clear indication as to how to join the triangles. The different colours help the child to distinguish each pair, and familiarise himself with the different combinations making the different figures, by putting the triangles of the same colour together.

If the child has understood the different combinations we have a second stage to discover. We ask the child to explain what he has understood without using words. We give him all the triangles in only one colour — blue. We ask the child to construct the different figures which he has built before with the pairs of triangles of different colours. There is now no distinction of colour. Only if the child has repeated the exercise many times and understood the construction (which triangles form which figures) can he make the combinations correctly. He must already have the distinctions in his mind in order to produce them by constructing the figures, as all the triangles are of the same blue colour. Even from the earliest of the sensorial stages the child is shown the function of the triangle as the constructor of figures. There is a special branch of geometry called triangulation, based on the idea that all triangles which have the same base and height have the same surface area. Therefore, any irregular figure must be converted into triangles, in order to measure its surface. The easiest way to measure any surface is to find a unit of measure. To measure the side of any figure the length is measured in simple units, but to measure the surface area we must have square units of measure. We do not learn why this is so until we go to the university. In order to measure the side we must take a unit of measure (it can be a mile or an inch) which must always be the same. If it is an inch, we count the number of inches. If the sides of a rectangle are 7 and 5 centimetres respectively, the surface area of the figure is 35 square centimetres. Why? It is very simple. If we draw parallel lines one centimetre apart both ways on the surface of the rectangle (fig. 5), the surface will be subdivided into many little squares, each one centimetre in length and one centimetre in breadth. When we count the number of squares we will find 35 such squares, which is the same as multiplying the base with the height. This is very simple to understand. If the child can count linearly, he can just count the number of squares and calculate the surface area of the figure. The calculation of surface area is offered to a child of about five years.



(Fig. 5)

When only the base of the figure is subdivided into a certain number of centimetres, and not the height, there are no whole little squares to count. So we must cut the figure along its height, (fig. 6) and change it into one which can be measured (fig. 7). So to find the surface area of the parallellogram, we have to multi ply the base with the height.

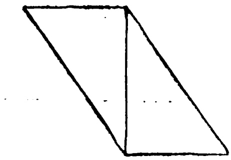


Fig. 6

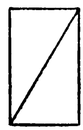


Fig. 7

We also have a way of measuring these triangles. A triangle is equal in surface area to a rectangle which has half its base and the whole of its height. In the case of the acute angled triangle we multiply the whole of its base with half its height. To transform the obtuse angled triangle into a rectangle, we must find half of its height. In order to know the height we have to draw a perpendicular making two right angled triangles, cut along the height and separate the piece at half the height. We have to show to the child in a sensorial way that no matter in what form the triangles are, they can be represented and transformed into rectangles.

So once we know that the triangle is transformed into a rectangle by multiplying its base with half its height, we can transform any figure into rectangles and count the squares to find the surface area. The child sees this in the sensorial stage and understands the functioning of the different rules for finding the areas of the different geometrical figures.

The area of the hexagon is the sum of all the bases multiplied with half its height, or the whole of the height multiplied with half of the perimeter. We find the surface area of the trapezium by multiplying the sum of the upper base and lower base with half of the height, that is we find the surface area of all the three triangles of which it is formed, the sum of the three bases multiplied by half the height. The height is common to all the triangles. The bases of the two triangles form the lower base of the trapezium (fig. 8).

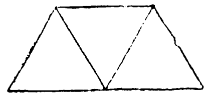


Fig. 8

There is one other material, (not yet ready for presentation) used to show how to find the area of the circle. It very simply shows us what $2\pi r$ means. It is in the shape of a cog wheel. The circle can be divided into triangles but the curve remains, and we have to calculate it. The whole edge of the circle, is called the circumference. This multiplied with half of the height (in this case the radius of the circle) is the surface area. We take a circle and make a mark at one point on the circumference. We make a line on the blackboard. We roll the circle along the line until we reach the mark on the circumference again. On the line on the black board, we make a mark. We now have the length of the circumference of the circle. We divide the circumference into parts with the diameter of the circle, placing the diameter of the circle on the board along the line marked. No matter how big or how small the circle, there will always be three times and a little bit of the diameter. The diameter is twice the radius. The relation between the circumference and the diameter is always 3 and a little bit more which is represented by 22/7. So the surface area of a circle is $2\pi r$.

CHAPTER 19

To awaken the child's interest, we give to the imagination, the complex whole. This is the first step to take, in giving the child culture. Gradually the exactness of this whole is grasped by the imagination. The child loves things which are exact. To give this small item in a very exact manner is in contrast to that great thing we have given to the imagination. It is like the psychological method illustrated in sensorial education. The first thing given is the contrast, and from the contrast we pass on to the gradation, into something that develops gradually. This method for studying the different items of culture in a gradual progression is possible only by first arousing the interest of the child.

We trust ourselves to the imagination, and then to practical experience, and later on to observation, rather than first to memory, as is done in traditional schools. It is certain that we cannot do without memory, but memory will retain everything that has been acquired by experience and observations. So memorisation is only by the way. This is neither very difficult to understand nor inaccessible to the child of seven years. If we put some salt into the water in a cup it dissolves. When no more salt can be dissolved in the water, we say that the water is saturated. Hot water has greater dissolving power than cold. However this is true only of certain substances that are soluble in water. If we put a stone in water, it will not dissolve even if we boil the water.

Water can be studied from different points of view. It is a substance which readily assumes one of the three physical states of matter — solid, liquid, or gas. We determine the three forms, by using the exact words. This forms a part of physics. We cannot study anything in nature, without entering into some field of science. When water evaporates, it leaves behind the substance that is dissolved in it. This also forms part of physics. So it not necessary to start the child on the study of physics only when he is fourteen years of age. In fact the study can accompany the experiences of the child at all stages. We cannot start our studies without experience.

There is an enormous quantity of water in the world. There is water not only in the oceans, but also in the numerous rivers. If we study maps closely, we can see that the land is permeated by the little or great rivers which form a complicated system, almost like the system of blood circulation in the body. We all know that water may be found in solid form in nature, perhaps not in Madras, but certainly in India. Water which is solid, but not compact, is found in the form of snow, and that which is more compact, in the form of ice. There is a great deal of ice in the world — at the Poles, on high mountain ranges like the Himalayas. We know that water evaporates continuously in the form of vapour, when we see clouds. Boy scouts study the forms of the clouds and classify them. These are similar to the classifications made in the study of botany or zoology. The child has an enormous interest in the study of clouds, so we have introduced it into our schools.

The rivers continuously come down from the mountains and flow into the oceans. There are great blocks of ice in the world. By studying water and its three physical forms, we enter a little into the field of geography and physics, and thus into almost all the sciences. When we study the decimal system we see that there can be only nine little loose beads in every hierarchy and that when a tenth bead comes in, all of them together form a ten, a unit of a superior hierarchy. After all what are the sciences but the artificial subdivisions of natural things, the elements of which enter each study.

Let us suppose that the great mass of water at the Poles has a certain temperature. On approaching the Poles the water becomes colder and denser. The water might think — "I have become heavier and denser. If I drop down to the bottom, what will happen to the fish that live beneath me? I will crush them, and kill them all and bring about a great disaster. So I must make a great effort to save the poor fish." When the water is close to freezing point it becomes lighter and expands, and instead of going down, it goes up. This is something unique and marvellous in the story of nature. There is no other substance which on becoming solid, does not also become denser and heavier. This peculiarity of water must lead us to think. If water did not have this unique way of solidifying and becoming lighter, our world could not exist! In becoming solid, water instead of becoming heavy becomes lighter, and protects life beneath the ice.

Although this little story is a striking example, it cannot be used for the purpose of making the child realise the natural law. The child however, can be helped to realise this easily through his own experience. In a cold country like Holland, if the water in the pipes is allowed to freeze, the expansion is so great that the ice breaks parts of the pipe and floods the whole house. This is an example of the expansion of water.

In nature water does not merely run in the rivers. It goes everywhere. Sometimes small holes in solid stones become filled with water. In the cold season this water freezes, and in freezing expands. Its strength is so great, that not even stone can withstand it, and breaks up crumbling into dust. Thus water erodes the pavements of the streets, and even monuments[1]. When it is in the form of liquid, it dissolves certain salts and carries away, by the strength of gravity, the calcareous parts of the stones, and gradually destroys the whole. So we see another aspect of water. It is no longer a well-meaning being, making a great effort not to kill the fish. Instead water becomes a worker, a sculptor who acts upon the stone. What do sculptors do after all? They chip the rock until it has assumed the desired shape. Thus also in nautre, water sculpts the mountains and leaves behind monuments that are marvels of nature[2]. What enormous tasks nature performs! What wonderful monuments she builds, and withwhat artistry!

Among the great marvels of nature, are the great caverns filled with stalagmites and stalactites[3]. We may tell of their creation in the form of a story. The water in its work as sculptor absorbs so much of the matter of which the stones are composed that it can no longer hold it. So it finds a cavern and flows into the empty space. After a time, the water evaporates, leaving the salts behind. The salts are not visible when in water, but when the water evaporates the calcareous material remains hanging. If the water evaporates while on the ground, the calcareous material

---

1. In the original manuscript Dr. Montessori points out that in a hot country like India, monuments stand for a long time, and that in colder countries they cannot stand as long against the work of nature.

2. In the course of this lecture, Dr. Montessori held up pictures of many natural wonders, caused by erosion.

3. Limestone is a type of sedimentary rock. Many limestones are the remains of corals. The continual seepage of water down the walls of underground limestone caves over thousands of years form strange *icicles* called stalactites (which grow downwards) and stalagmites (which build up from the ground). Sometimes these meet and wierd and beautiful shapes and columns are formed. Such caves produced by the effect of water dripping from the ceiling contain fantastic shapes. Limestone can be metamorphosed by heat, pressure or by the influence of other substances into marble.

accumulates. The years and centuries pass by, until the material hanging from the roof of the cavern and the material accumulating on the ground, meet one day, and solidify forming huge pillars. The stone in the cavern is a special translucent stone which lets the light pass through. When the men who venture to visit the cavern light their torches, a world of wonder appears before their eyes, assuming different colours, yellow, red, green and orange. Some parts of the carvern assume the shape of altars. Sometimes it looks as though a curtain has been strung across the cavern. Sometimes there are transparent pillars full of limpid water.

This, purest form of calcium carbonate, left behind by the water is very difficult to find in nautre. As soon as the discovery of one of these caverns is made, a pilgrimage is started to visit the place. There are many such caverns in Italy. People come from all over the world to visit them. Even poets become inspired by the sight. As the visitors pass from one cavern to another, a drop of water may fall, one of the drops that has continued to fall through centuries.

One day, all the marvels disappear and one great mass of pure calcium carbonate fills every nook and corner of the cavern. This mass forms one of the rare, translucent marbles called alabaster, which is widely appreciated. Sometimes it has veins of different colours — green, pink, and sometimes slightly red.

The worker of these marvels is water. It builds up monuments and accumulates riches underground, leaving them to be discovered when we need them. It protects the fish from being crushed by its weight. It is intelligent, artistic and full of charity. If it was not for the continuous contact that we have with water, none of us could exist. We live because we have water to drink.

When we study the work of water, we see that it gathers up calcium carbonate, carries it along, and throws it into the ocean. This happens every second all over the world. Now, we must call in mathematics to our aid. The Mississispi river throws eight million tons of calcium carbonate into the ocean every hour. If we multiply this number by 24, and then by 365, we can arrive at the amount of calcium carbonate carried away every year by this river alone, and then by all the other rivers. This is an immense quantity of calcium carbonate! The water of the oceans continously evaporates. When water evaporates, it does not carry away the salt. All the salt is left behind. It has been established by experiment that if the quantity of calcium carbonate dissolved in the sea were to increase even slightly, all the living beings in the sea would die. There could be no life in the oceans or on the land. This poison has been continuously thrown into the ocean day after day, and minute after minute, for centuries. Yet if we examine the water of the ocean, we find a great many different salts but not a trace of calcium carbonate! When we look at nature, we find many contradictions. The sea should be full of calcium carbonate and there is not even one bit of it. Fish live in the water tranquilly and they multiply in incredible numbers without any danger to life.

Where does the calcium carbonate go? How does water find the power to make all the calcium carbonate that drains into the ocean disappear? Entire castles are built and also destroyed by little drops of water which fall upon them. Gigantic mountains, in the course of centuries, are carried into the ocean. How does water dissolve stone? Where does the stone go? It is one of the marvels of nature that the water always remains pure for life to exist.

CHAPTER 20

In mathematics, we first present that which gives a complete vision of the whole. When we first grasp the whole idea, and then begin to investigate the details, they become simple, unique, and infinite in number. It is like examining the human body. The vision of the whole body of the human being is very simple. Our imagination grasps the functions of the body and then we study the details. In studying anatomy, we learn that the body is made up of two pairs of limbs, the legs and arms, a trunk, and a head. Then we begin to study the various organs of the body — what is inside the head and so on. We can still further make a study of the cells. The details appear and the impressions grow. Each one of them is extremely important and interesting. So it is in the field of mathematics.

One of the functions of the decimal system was to show the different hierarchies. We started with the simple units 1 to 9. Ten units made one ten, 10 tens joined together made a hundred. Ten hundreds joined together made a thousand. They all started from that one little bead which was the unit. We know now that there are four different hierarchies — unit, ten, hundred, and thousand. We might say that is the end of it, but another field opens up immediately. As we had the hierarchies of the decimal system, we also have the hierarchies of the six system, or the four system. In reality we may have as many systems as there are numbers and in each number there is the same degree of groups. The simplest is the single bar. There is also another square which has as many bars as there are beads in the bar. For instance, in the bar of 2 there are two beads. This is the first hierarchy. The second hierarchy has as many bars as there are beads in the bar, two bars of 2 making a square. So the second hierarchy is called the square of the number which is formed. All systems have the same hierarchies — the 2 square, the 4 square, the 6 square upto the 10 square. These are obtained by multiplying the number by itself — 10 bars of ten, 3 bars of three, and 100 bars of a hundred. This new group of hierarchies has a higher level than the simple groups. There is no limit to the levels in the hierarchies.

We now have material to help the child imagine the unlimited increasing levels of the hierarchies, a unique aspect of the decimal system. The small cube which represents the unit is green in colour. Ten of these little cubes make a ten, represented by a single bar of wood painted blue (the symbolic colour of the tens) and divided by ten green lines It is formed by the units. The symbolic colour of the unit is green, hence the green lines to mark each unit in the bar of ten. The colour of the square hundred board is red, because the symbolic colour of the hundred is red. There are ten blue lines across it, because it is formed by ten tens. This is the highest rank in the first level.

When there are ten of the hundreds, we have a new level. The thousand is the unit of this new level which has three hierarchies — the thousand cube, the ten thousand bar and the square board of hundred thousand. Once again, when we come to the million[1], we have a higher level, and the same three hierarhies — the million cube, the ten million bar and the square board of hundred million. Each unit acts

1. The material for the hierarchies stops with the huge green cube of million with the red lines to demarcate the ten hundred thousands in the million.

as the head of the family, and gives its own name to all the hierarchies of its own level, the unit, the thousand, and the million. There can be only three degrees in each level. Each time there is a new hierarchy, the level is raised. The huge cube of a million is built in proportion to the small unit, so that the unit is a millionth part of the unit of million represented by the huge cube of wood. Thus we see a strange fact — for every three places, the forms repeat themselves. These are called mathematical powers — the square, the cube, the fourth power, the fifth power and so on.

When we study mathematics, we are told that after the third power we cannot materialise anything. After the third power we get the fourth power, but there are only three dimensions. A prism has only three sides. If we increase it, there is no fourth dimension, so materialisations are impossible. This seems logical, but it is not true. For instance, we can take the square of ten multiplied by the square of ten, which is equal to 10 to the power of 4. This does not mean that 10 to the power of 4 cannot be materialised. We do not go into the fourth dimension. However for every fourth power, we can get a longer prism! Similarly for every fifth power we can materialise a square, and for every sixth power a cube! For every three, the form repeats itself — the third, the ninth, and the twelfth. Every time, the same powers repeat themselves. If we want the fourth power of a cube of 2 centimetres we have $2 \times 2 \times 2$ (which is 2 cube), which multiplied by 2, gives 2 to the power of 4. In order to have the fourth power, we take two cubes of 2 centimetres and put them one next to the other, to make a long prism made by both cubes. This is the form of the fourth power. If we want the fifth power, we can take two more cubes of two and place them next to the long prism to get a square. Therefore for the sixth power of two we will get a new cube. We always get the same — a long bar, a a square, and then a cube. So we can individualise all the powers and represent them.

Mathematicians long ago must have realised this, because they have always taught us to start counting from the right. Transmitted from generation to generation from memory, the reason has been lost. However the method for marking by threes remains — 9,785. After all we say nine thousand seven hundred and eighty-five and not ninety seven hundred and eighty-five[1].

To make mathematics really interesting to the child, we have to help him find a sensorial appeal in it. That is why these materials are introduced to the child in the sensorial age. We do not explain anything to the child. We merely give the simple units, then the bar of ten, then the square of hundred, and the cube of thousand.

When we present the Number Frame[2] to the child, we tell him that each row represents the different hierarchies. In the first row there are ten green beads, simple units. Each of the beads in the next row represents a ten. The

---

1. In the original manuscript Dr. Montessori duly notes that in the United States people do say ninety seven hundred and eighty five. She also notes however that even so while writing they mark the hierarchies by threes—9,785.

2. The frame described in the manuscript appears to be what is today known as the Short Bead Frame. It has four wires across held taut, each strung with ten beads (from top to bottom) in green, blue, red and green respectively, representing units, tens, hundreds and thousands.

The paper chart (today called notation paper) used with this frame has 28 horizontal lines, and also 4 vertical lines of the hierarchies (from right to left) in green, blue, red and green.

However the activity described (going upto millions) refers perhaps to what is today called the Long Bead Frame. It has seven wires across held taut and each strung with ten beads (from top to bottom) in green, blue, red, green, blue, red and green representing units, tens, hundreds, thousands, ten thousands, hundred thousands and millions.

The notation paper used with this frame has horizontal lines and 7 vertical lines demarcating the hierarchies in appropriate colours.

For more information see *The Advanced Montessori Method Vol. II* next row has red beads, each representing a square hundred. Each one of the green beads in the next row is a unit of thousand. In order to help the child become familiar with the use of the Number Frame we once again bring the decimal system into play. There are operations which the child can carry out with this material, even before he is offered the Snake Game, even before he has learnt the combinations by heart, and even before he understands the working of the decimal system fully. We earlier offered the child stamps as symbols. Here we offer another kind of symbol — a paper chart on which are marked vertical lines, in three different colours repetitively representing the three different hierarchies. For every three lines there is the same unit of a different level, and so the same colour.

In the first game with the Number Frame, we ask the child to count the beads in each row each time noting it on the first green line on the paper chart. When ten has been counted in the lowest hierarchy, the unit of the next hierarchy of 10 must be written on the blue line on the paper chart. When we get to 90, this hierarchy is finished. The unit of the next hierarchy of 100 must be noted up to 900 on the red line and the thousands, on the green line for the units of thousand, moving thus from line to line, and from row to row, until we reach the million. This is the first exercise. It is done starting from the right hand side.

Next, we give the child the Number Frame, and write the numbers for the addition on the paper chart, the units must fall on the green line, the tens on the blue, the hundreds on the red line and the thousands on the next green line for the next group (thousands). In order to do the addition, we start with the first row of green beads, and count the units. If we have 5 first and then 8, after counting the first ten the beads will be finished, so we add a new ten, in the second line, leaving behind 3 units in the first row. Then we count the blue beads, the tens. Next we pass on to the red beads, and so on until we have completed all the lines. When this is over, we have merely to check how many beads there are in each row of the Number Frame in order to find the result of the addition.

Subtraction can also be done with the aid of the Number Frame. To subtract we have to start from the right side, from the units. We count the beads of each hierarchy in the longer number. Our subtraction is :

$$\begin{array}{r} 9234 \\ -6987 \\ \hline \end{array}$$

To take away 6987 from 9234, we have to take away 7 from 4. We can only take away 4, because there are only 4 beads in the unit row. Then we go to the row of tens and change one ten for ten units. We can now take away the remaining 3 units. Then in the tens row, we have only 2 tens but we have to take away 8 tens, so after taking away 2 tens we change one of the hundreds into 10 tens and take away the remaining 6. Thus we go on changing and taking away till we arrive at the result by counting the balance of beads left in each row. There are 7 units, 4 tens, 2 hundreds and 2 thousands, so the answer is 2247.

To subtract 1 from 1000 sounds very simple. When we actually do it on the Number Frame, it is very complex. We have only one bead in the row of thousand and nothing from which to take away 1 from the units. So we have to start from the last row of thousand, and go up, changing one of the higher level into ten of the lower level each time. When we come to ten units, we can subtract 1 from it. The result is found by counting up the beads in each row. It will be 9 in each row thus we arrive at the result 999.

In subtraction and addition, we help the child take in a sensorial impression of the combinations, which are rendered conscious later on by means of the Strip Board. The Charts for addition and subtraction confirm the knowledge gained by the child through the Strip Board. The process is the same in multiplication. In the second exercise with the Addition Snake Game[1] we ask the child, instead of making groups of ten, to count all the nines, all the fives, all the eights and so on. If there are 5 bars of nine, he puts 4 tens and five, to represent them. Thus this second step offers the child a sensorial impression of the combinations of multiplication.

To help the child become conscious of multiplication, we use the Multiplication Board, a square board with one hundred cavities. These cavities are in ten rows of ten each. The cavities are meant to hold the beads placed in them, while counting. With this board we have a box of one hundred loose beads of any colour[2]. On top of the ten rows on the board, are written the numbers from 1 to 10. At the top left corner of the board is a large round cavity which holds a circular[3] red piece. On the left side of the board is a large square cavity with a slit. There are number cards from 1 to 10 which can be inserted into the square through the slit — the multiplicand. Along with this material we have a set of charts (similar to the ones we had with the addition combination chart) in which 2, 3, 4, 5, 6, multiplied by 1 and so on up to 10 are written, with a space against each combination for the result to be filled in. The number which is repeated is the multiplicand. It is inserted in the square place in the board. The multiplier is marked by the red piece which is placed above every number as we go on multiplying. When the child multiplies 6 with 4, he places the red piece on top of the fourth

1. This is now called the second Control of Error.

2. Today the beads used with the Multiplication Board are always red.

3. Today a red skittle is used.

row, where 4 is written. Thus the multiplier is marked so that the child may not forget at which row he has to stop. The child starts counting six beads at a time, placing them in each row upto 10, each time moving the red piece as required. Each child if given ten charts of the multiplication combinations, can fill up the result of the operations that he has done on the board in the chart. We also have confrontation charts so that the child may verify the results he has got. The results of all the combinations are given in the chart.

As multiplication is nothing but a special kind of addition, we find that in multiplication also there are certain combinations that are repeated, and which therefore, can be eliminated — 4 times 6, and 6 times 4 give the same result. When the child is familiar with the Multiplication Board and its use, we can also use the bead bars to show that although the results are the same, the operations done while multiplying 2 with 9 and 9 with 2 are different. The result in both cases is 18, but in the first case, we have only 2 bars of 9 beads, and in the second case 9 bars of 2 beads.

However as far as the memorisation of the combinations is concerned, it is necessary to realise that multiplying 2 with 9 is the same as multiplying 9 with 2. So only half of the combinations need necessarily be shown, the other half being repetition. In the Addition Chart, all the combinations that are repeated on the other side of the double of any number are omitted. In the Multiplication Chart all the repetitions which come beyond the square of a number are omitted. The squares of numbers form a diagonal in the Chart. The Multiplication Charts are used in the same way as the Addition Charts. The first one has all the combinations. There is a second, in which all the numbers that repeat themselves are eliminated. The half which is left out, is entirely useless as far as memorisation of the combination is concerned. Using the third Multiplication Chart[1] the child proves to us that he has understood the Multiplication Board. Along the sides, are the combinations to indicate what numbers have to be multiplied. There is a basket with result cards. By taking from the basket, one by one, the cards on which are written the results of all the combinations that are in the chart, the child finds the combination to which the result applies.

The Division Board is similar to the Multiplication Board, but with some difference. On the Division Board, the numbers from 1 to 81 are written inside the cavities in green[2]. There are three such boards, one for the units with a green strip, one for the tens with a blue strip and one for the hundreds with a red strip. The numbers from 1 to 9 are written horizontally and vertically. There are also little skittles to represent the units, tens and hundreds. The unit skittles are green, and occupy the cavities of the board with the green strip. The blue tens skittles will occupy the cavities of the board with the blue strip, and the red hundred

---

1. Today, the third Multiplication Chart and the fourth Addition Chart are also called Blank Charts. The result cards mentioned here are small square tiles which fit perfectly on the blank squares. Today, we first let the child lay out the tiles in an orderly fashion and then let him find the right tile for a particular blank square.

2. Today a separate Unit Division Board (with the green strip) is offered to the child first. It has 81 cavities. The top green strip has 9 cavities and marked by the numbers 1—9.

The numbers 1—9 also appear vertically numbering the holes on the left extreme. However the 81 holes are not individually numbered today. The board is accompanied by 89 green beads in a box. 9 green skittles, a green bowl to hold the remainder and printed tables with blanks to note down the combinations.

Later the child is offered four Division Boards with the green, blue, red and green strips respectively with 700 beads in test tubes. This material helps the child to do division with many digits in the divisor.

For more information see *The Advanced Montessori Method Vol. II* skittles will occupy the cavities of the board with the red strip, according to the number that they represent. If, for instance, we want to divide a number by 215, we must use all the three boards, — the 2 red skittles will be placed in the two cavities of the red strip, the blue skittle in the first cavity of the blue strip, and the 5 green skittles in the five cavities of the green strip, on the respective boards.

When the child learnt the combinations of multiplications, he also acquired the subconscious knowledge of the combinations of divisions. After all when the child multiplies 3 with 2 and finds that it is 6, he also sees subconsciously that 6 divided by 2 is 3, or that 6 divided by 3 is 2. The child already knows the division. It is now only necessary to offer him the mechanism of division. So if for instance, we ask the child to give us a number which when divided by 2 would give a result less than 9, the child would have to work out all the combinations which when divided leave no remainder. These are limited. The numbers that are found on the multiplication board are the only ones which leave no remainder.

In the Multiplication Chart, only one combination was possible for 81, 9 multiplied by 9. In the Division Chart, for 81 we have one combination — 81 divided by 9. For 72, two combinations exist — 72 divided by 8, and 72 divided by 9. So we see a certain correspondence in the combinations. The prime numbers on the chart must all be in one colour. All the factors of the different prime numbers are also on the chart. The child also sees that each number between 49 and 56 is divisible by 7, leaving a different remainder in each case. By using this material, the child learns the nature and function of division.

This is the passage into abstraction, the passage from the material to paper, in carrying out operations. After a while the child will leave the material and solve problems directly on paper. Usually a great error is committed in traditional schools. No link is made between the material and the abstraction, offering the child only either of the two. This can become an extra burden on the mind of the child later on. We must first present the whole idea through materials and help the child move freely towards abstractions.

CHAPTER 21

How can we offer the child a fixed basis for religion, such as we have in mathematics? How can we give the real idea of religion to the child in such a manner that it does not clash with other religions? How can we give the child the abstract idea of God? How can we reconcile the idea of the goodness of God, with all the pain and misery in the world, both among human beings and animals? Is man the creature of God or the creature of the Devil? Is he born in the world only in order to kill others? If we go into this kind of abstraction based on the persuasions of others, without materialisation, we can never agree on the facts.

We can materialise religion and God, just as we can materialise mathematical formulae. God has placed enormous powers in the hands of man in order that plenty of work may be carried out in a human being's lifetime.

When I was very young, I was told, as small children are told, that God was everywhere. Although I could not see Him, He would always protect me. He was always at work, and knew all that was happening around me. When I was of reasoning age, I did not believe this, and I started studying it along scientific lines. They say that study along scientific lines will destroy religion, because what religion says is scientifically untrue. However when I understood religion for the first time, I understood the truth of it.

Nothing in this world is wasted. In the end everything goes away because it has to go. When we do what we think we want to do, we merely act according to the will of God. This sounds very vague. It is said that God has no hands, no eyes, no mouth and no organs, yet He does everything. If He has no means with which to work, He must have someone who works for him. So I presumed that God has many machines working for him. These are of three kinds — some are inanimate, some are animate and some others are intelligent. The inanimate machines are the properties of nature — the water, the minerals and so on. To the animate machines, He has given certain instincts. The instinct of the crow, for instance, leads it to the special task of its life. Crows are voracious eaters. The more voracious they are, the cleaner the environment! In carrying out this task, the crow obeys the will of God. In obeying the will of God, the crow does something for the maintenance of the universe in which it lives. Each animate being has its allotted task. The intelligent machines are human beings. To us, He has given, not any set laws or distinct instincts, but the possibility of doing anything. Common and simple rules are given to all the three forms — to be born, to grow, to do the allotted work, to reproduce similar beings to work in the world, and to die. Not a drop of energy is wasted. After death everything is absorbed by the earth in the form of manure, in the form of carbon and other chemicals.

God is goodness personified and glorified. To each living being, He has given perfect freedom, the same chances of life. When the eggs of a fish are laid, they all have the same potential. When they hatch they all have the freedom of the waters. Whether they live or not, greatly depends upon themselves. God has given to each living being the instinct of self-preservation and self-protection. So He has taken all the possible precautions to defend that life. If that life is lost, it is either the fault of that individual, or of those who had the care of that being. He has caused some beings, when they reproduce, to feel mother love. The birds and mammals love and protect their young ones. However the fish which lays millions of eggs, and leaves them floating about in the waters, has no love for its young. Why is this so? It is because, the fish need no love. If each one of the eggs hatched and lived to become a fish, there would be no water but only fish. So out of the millions of eggs that are laid, only a few become fish, the others perish. In the case of the birds, almost all of them live, because the parent takes care of them.

If we study life we see that there are certain things which are painful. Once, after a severe earthquake in Italy, a man was pinned down his arm caught under the debris. He could not extricate himself, but he was eventually rescued. When he visited us and told us about his experience, of the horror and the pain that he had suffered, I was a child of ten years then, I felt that if only I had been there, I could have lifted up the stone, and helped him out. Suddenly, I smelt something burning. It was his own hand. It was so paralysed that he had no feeling in it. This made a great impression on me. Once a mother who saw a child suffering said — " How can God be good? Look at this child! How the poor little creature suffers! " Whenever there is any danger, the child's instinct of self-protection acts like an alarm bell warning him of the threat to his existence. If we do not experience pain, we cannot protect ourselves.

Each living being, even tiny little creatures, are given safeguards. This protection is not only given in the physical field, but also in the moral field through fear. If it was not for fear, how many of us would be here? If we saw a car coming at us on the road, and our instinctive fear did not make us move away from it, a great many of us would be dead. If we did not run away or hide from danger, the chances of living would be very remote. Even the characteristic considered to be the weakness of the individual, has been given to him to protect his life, so that the species has a chance for survival.

It has taken me a whole lifetime to realise why some animals kill other animals. Why should death be the rule among animate beings? Each being has a reason for its existence — a task to accomplish in its life. It is difficult to realise what this task is. If a fish laid 60 million eggs, if all the eggs hatched into fully grown fish, in three years there would not be a drop of water left in the oceans. So there has to be some check. The hunger which is the driving force of the other creatures of the ocean, causes the eggs to be devoured. In eating the eggs, these creatures are carrying on their part of the work in the world. Each being in working selfishly for its own gain acts as a check to the other. This check is its task.

In Holland they once closed the Zuider Zee[1] because they wanted to reclaim some land. By closing off the sea all the salt-water fish died. The mosquitoes came in such numbers that they had to call in the fire brigade to destroy them. The mosquito nuisance was so great because there was no check on the millions of eggs that were laid by the mosquitoes. They multiplied in huge numbers. The fish which would have killed the mosquito eggs were all dead, the sea water having been shut out.

In Australia, there were no rabbits at all. Someone who went to Australia carried two little pets and left them there. They multiplied in such incredible numbers that

---

1. The Zuider Zee was formerly an arm of the North Sea, penetrating into the northwestern Netherlands. It is now almost wholly reclaimed. In the 13th century the sea broke over the dune-edged coast, flooded the lowlands behind it, and formed an inland lake. The Zuider Zee remained very shallow (nowhere deeper than 12 metres) and received the River IJssel. In 1918 the Dutch Parliament decided to reclaim the Zuider Zee to provide a new province for the country. The work began in 1923 and the enclosing dam, the *Afluitdiik* was completed in 1932, transforming the Zuider Zee into a fresh water lake, the IJsselmeer.

the Government of Australia had to make special laws, and call in the army, and the farmers who killed about 15 to 20 thousand rabbits a day in order to control the pest! As there were no wild animals, no carnivores, in Australia to check their increasing numbers, the rabbits yet continued to multiply until they became a real danger to all other living beings. They dug burrows all over the country and devoured all the things that they could find. The land was so full of burrows that water ran into them and all the lakes became dry and famine resulted. So finally the Australians imported wild animals that could eat a large number of these rabbits.

What is true of the animal world is also true of the vegetable world. The farmers in Australia in order to protect the crops in their fields from kangaroos, planted a kind of thorny fence of cactus around their fields. It was such a quick growing plant, that in ten years a whole province was covered with it. New laws had to be framed by the government to destroy these plants. It became a pest. Even if it was cut, the spines took root and spread very quickly. Finally zoologists were asked to investigate the matter to find out what insects or animals would eat the plants. The zoologists found a Mexican insect that could eat these plants, which were received in Australia with relief. In five years, the pest was well under control.

When we study the work carried out by each little insect, we understand the wonderful cosmic task that it performs for God. We see that by working towards its own selfish ends, it preserves the equilibrium in the world. It does its part of the work, and thereby gives pleasure to God.

There is another point of view. Who could be a greater inventor than God? Who could invent a bicycle which when it became old would leave two or three bicyles? The animals which are the creations of God's work, when they can do no more work, leave two or three little replicas of themselves to carry on. Can anyone be a greater economist? Can anyone invent a machine which generates no waste? All animals, and all human beings, are formed of the same elements. When a creature is dead, the microbes begin to work, and dissolve its body into the component elements. When these microbes are at work, we say putrefaction has set in. A nasty smell is emitted. After these microbes have done their work, a new kind of microbe that lives without oxygen begins to work. These nitrogenous microbes gather all the rotten stuff left by the other microbes, and separate them into the different elements of which everything is composed — carbon, nitrogen, and so on. So even after the creatures work is finished and after it is dead, nothing is wasted. The air gets the oxygen, the earth gets the carbon, each in their purest form, from the elements that composed the body, and thus supply the means for the other forms of life.

It has been calculated that only 3% of the water that remains in this river[1] after supplying all the vegetable life on the river banks, flows into the sea. So there is always some water left in the river as a reserve for the plant life in the summer season. The water does not flow into the sea because the river is checked by the force of the waves that continuously shovel up sand on the beach, thus making a bund. The force of the river during the summer is not sufficient to cross the bund to reach the ocean. During the rainy season, there is plenty of water in the river, and it attains a greater force than the waves, so the water crosses the bund to flow into the sea. This does not happen in the summer because if all the water flowed into the sea, the vegetable life around the river basin would perish.

1. The river described here is the Adyar River which runs along the Theosophical Society in Adyar, Madras even today. Dr. Montessori's residence in the Thesophical Society at that time overlooked the river and its estuary.

We, who are materialists, have certain animal instincts, such as the greed for power, for possession. When our animal instincts are uppermost, we are no more the souls of God that we are represented to be. Even these human beings have some checks in their lives. Even when we function as animals we carry out the task for the upkeep of the world.

Abyssinia[1] was unconquered for many thousands of years. It was a very powerful country with a glorious past. Nothing seemed to shake its integrity. Then what happened? The people did not change with the growth of their civilisation. Their civilisation was not sufficient for the distribution of property and the elimination of slavery. They had gold and other riches, but they did not reach the level of civilisation that the other countries had reached. We all know what happened. The Italians decided to civilise Abyssinia. Due to the greed of another country, all the lands in Abyssinia that were not used, began to be used for cultivation. People began to work in an organised manner, and to produce many more machines and useful articles. Abyssinia is now on par with all other countries. If one set of people do not work by their own free will, others who are more powerful do it for them. The moral basis for work for human beings should be along the lines on which our intelligence guides us. Materialists do not use their intelligence clearly in the construction of moral work. They are guided by the animal instincts of possession and greed. They destroy religion and work against the forces of moral construction. They use religion to suit their selfish ends. In our religion, we say that we have one God. We have a symbol — the Cross. We say our prayers and have a mode of greeting. In certain other countries, like

1. Ethiopia, formerly known as Abyssinia was invaded by Italy under the leadership of Mussolini in 1936. The Italians ruled Ethiopia till 1941.

Germany and Russia[1], they say that they have no religion. In Germany, they have their own organisation, their own group which they worship. The Russians have created a new form of worship. The psychology of religion however is the same for all.

We find innumerable such examples by which God has found the means of keeping the balance in the universe. When we begin to understand the working of this universe, then everything assumes a meaning. We begin to see into the how and why of things. Each being has a certain task to do, a rule to obey. Evolution therefore takes place only along these set lines.

---

1. At the time of this lecture Nazism and Communism had found wide support in Europe. The National Sozialistische Deutsche Arbeiterpartei (hence the popular contraction Nazis) was founded in 1919. It gained ground rapidly after 1928 due to weak governments, economic distress and popular resentments. Adolf Hitler came to power in 1933.

CHAPTER 22

We can show the child that the sum of all the angles of a polygon is equal to 2n - 4 right angles, where *n* represents the number of sides. When we offer this rule of geometry to the child we must show him what is meant by it. The rule originates from the triangle. No matter what the form of the triangle, the sum of all the three angles of any triangle is always equal to two right angles. This is difficult to explain to the child theoretically, but if we illustrate it practically with the materials, the child can easily see it. We can take three different kinds of triangles, a right-angled triangle, an acute-angled triangle, and an obtuse-angled triangle (Fig. 9) and cut each one, separating the three angles in each of the triangles. The three different angles of a triangle

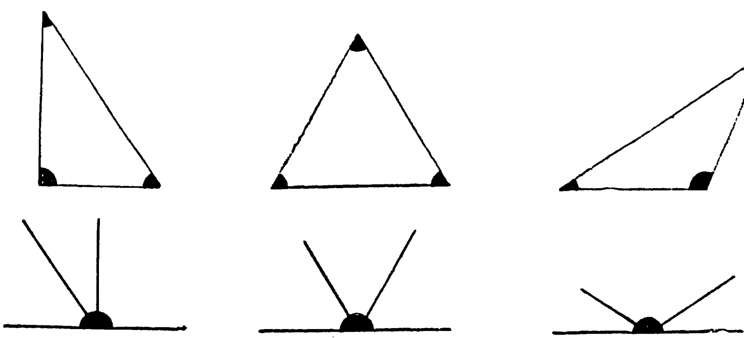


Fig. 9

when they are placed one next to the other, form half a circle (180 degrees) which is two right angles. So the sum of the three angles of any triangle is always equal to two right angles.

We saw that the triangle was the constructor, and that all the other figures were built up by the triangle. So the sum of the angles of any polygon will be measured by the number of triangles that compose it. The sum of the angles of the rectangle, and the square will measure one circle (360 degrees) as each of them has four right angles. So when all the four angles are cut and placed together, they form a circle. Even in the case of the trapezium, the parallelogram, the rhombus, or any four-sided figure, all the four angles together form a circle. So in the four sided figure, 2n - 4 right angles, will mean 8 - 4 right angles. Four right angles add upto 360 degrees. In the case of the triangle which has only three sides, it is 6 - 4 right angles. Two right angles add upto 180 degrees.

The child may not understand why he has to subtract the four right angles. We have to illustrate to him why this is so, by means of some material. Let us take a polygon, which is formed by six triangles. The sum of all the angles of the six triangles in the polygon is equal to twelve right angles which is three circles. No matter how many triangles the polygon may contain, the sum of the angles formed by the triangles in the middle of the polygon, is always equal to one circle. There can be any number of sides and any number of angles, but the angles in the centre are equal to a circle or four right angles (360 degrees), hence the rule is 2n - 4 right angles.

The child is given a set of ten circles. The first one is a full circle, the next is divided into two, the third into three, and so on until the last one is divided into ten. The circle that is divided into three contains three obtuse - angled triangles[1]. The circle divided into four contains four right - angled

---

1. In this paragraph the sectors of the circle are referred to as triangles.

triangles. With this material, we can show the child that the angles of all the triangles below the right-angled triangle are below 90 degrees, and that all measurements in a polygon are made by the right angles. These circles are used for the measurement of angles by degrees and for the addition, subtraction, multiplication and division of the angles. They are also used for learning fractions. This material is made either of iron or brass. All the ten circles of the set are red. The frame is also red.[1] When the pieces are taken out of the frame, a white space is left visible to indicate the place of the piece.

The child between five and five and a half years of age has understood the function of these figures. We can now show him the minute details — a more microscopic study of numbers. We must give a very clear presentation of the facts in order to retain the child's interest in these details. We explain to him that the fractions are the broken pieces which form the unit, and that the names of the fraction are given by the number of pieces into which the unit is broken. We can also show teach the child how to express the fractions. The upper number is called the numerator because it indicates the number of pieces that have been taken out of the whole circle, and the one below is called the denominator because it indicates the number of pieces into which the unit has been broken. We can ask the child to take two pieces from each circle, thus making 2/3, 2/4, 2/5 and so on. In each case the denominator is determined by the number of parts into which the unit has been divided. The denominator also gives the name to the fraction by indicating the category of the circles from which two pieces have been taken. It may be a unit broken into three pieces or four or five as the case may be.

1. Today the frames in which the fraction insets are placed are green. The material may also be made in wood.

At a later stage, we can show the child that when all the pieces into which a circle is broken are taken together, we no longer have a fraction. Though it can be expresssed in the form of a fraction, 5/5 or 6/6 for instance, it is still the whole circle. After this the child is given the cards on which the fractions are written. The child takes out two or three of them and finds their sum. In traditional schools, one of the most difficult things for the child to understand is why he has to divide in order to multiply fractions. It is necessary to give the facts before giving the rules, because the child has not yet arrived at making abstractions through rules. In order to add fractions that are of the same denominations, we add the numerators and leave the denominator as it is. The child may ask why it is necessary only to add the numbers on top and not the numbers below. We can show the child the circle divided into five parts, and ask him to add up 2/5 and 1/5. The child will see that 2 and 1 make 3, and that both pieces belong to the same circle that is divided into five parts, thus the result is 3/5. So the child understands why he has no need to add the denominators. In the case of subtraction 3/5 - 2/5 is equal to 1/5. From the three pieces of the circle which is divided into five parts, two of these pieces have to be subtracted, which leaves one part of the same circle equal to 1/5.

In the decimal system, ten loose beads of a lower hirarchy changed into one of a higher hierarchy. In the case of fractions 2/4 can be substituted by 1/2, the value of both being equal. This brings us to another rule in fractions — when we multiply the numerator and the denominator by the same number, the value of the fraction does not alter. So also if we divide the numerator of the fraction and the denominator by the same number, the value of the fraction does not alter.

In 2/3, if we break each one of the two pieces into three equal parts, we get six pieces. Now the denominator also has to change because the six pieces do not belong to the circle divided into three parts any more. So the denominator has also to be multiplied by 3, which is 9. The value does not alter because the space occupied in the circle is the same — 6/9 = 2/3.

To multiply 1/6 with four we ask the child to take four pieces of 1/6. The child sees that the denominator remains the same and that the numerator is multiplied by four. So the rule is that in order to multiply a fraction by a whole number, we multiply only the numerator by that number. So 1/8 multiplied by four will be 4/8. As the child knows how to change the fraction by substituting the smaller fraction, he can change it into 1/2. So we see that whether we multiply the numerator which is four with four or divide the denominator which is eight by four, the result is the same—1/2.

There are two kinds of divisions — simple distribution, and transformation of the fractions before the distribution. The division is done with the help of skittles. To divide 4/6 by two, we have two skittles, and have to distribute 4/6 between them. We divide the four pieces equally between the two skittles. The denominator is the same because the pieces that are divided form part of the same family, the same circle. It is equal to 2/6. The 2/6 is then changed for 1/3. This is a division in which there is only distribution and no transformation. To divide 1/5 by 2, we have to break it into two parts as one piece cannot be distributed between two skittles. If we break 1/5 into 2 parts we can distribute half to each skittle. Each gets 1/10. In this case, the operation is carried out on the denominator and not on the numerator. The denominator is multiplied. The rule is that in order to divide a fraction, we can either divide the numerator or multiply the denominator.

There is another kind of addition or subtraction in fractions, where the denominators are not alike. For instance, (1/3+1/6)=(2/6+1/6)=3/6=1/2. We have to break the 1/3 in the sum into 2/6 and then do the addition. It is the same in subtraction. To subtract 2/8 from 1/2 first we have to break 1/2 into the parts of the denominator of 8. So (1/2 - 2/8) = (4/8 - 2/8) = 2/8 = 1/4. So the rule is that in order to add or subtract fractions we have to first find the common denominator.

There are three periods in the study of fractions. In the first period the child is presented with the material and works with it sensorially. This period lasts for about six months. The second period is that when the writing down of the fractions is presented. The third period presented at the age of seven years give the rules of fractions. The child knows the rules already through experience, and practice. These have to be expressed in words. Unlike traditional schools, we give definitions of these rules in as few words as possible, describing a long experience. So the rules come last. When asked to express the facts that he has seen in his own words, using the minimum number of words possible, a child may at first make long speeches in order to express the rules that he has learnt. His interest may be aroused in trying to give the rules clearly, in the fewest possible words. Finally when the teacher gives the classical definitions, the child is enthusiastic and eager to learn them by heart, as all that was necessary was said in a few clear words.

CHAPTER 23

All teaching should start from an idea which gives the vision of the whole. When we speak about the earth, there are very many things to be considered. A great many of these have been created and built up by animal life.

We saw that water in its superficial task upon the earth, devours it, and throws all the matter that it devours into the sea, even the rock-like marble composed of calcium carbonate. If we think about the length of time that this has been going on, we would logically conclude that all the earth would be washed away by now, and that the whole sea would be neither water nor land, but just a kind of mud in which no living being could exist. Yet in reality, we find that the water always remains of a constant composition. It evaporates, but these minerals do not remain in the sea. No matter how closely we examine the water almost no trace of calcium carbonate can be found.

Thus there are two agents working in opposition one to the other — the water destroys the land, and certain living animals purify the water. To seek the living beings which purify the sea water, we must study zoology. There are three groups of these animals. All these groups have to take the material from their environment, in order to build up shells. Their environment is water.

The first group dwells partly on land and partly on water. They require very special living conditions. These animals which dwell near the shores are the least important as far as the task of purification is concerned. They are called shell fish or molluscs[1], and are well known by the beautiful shapes and colours of their shells.

The second group consists of very primitive beings, made up of merely one cell. These microscopic creatures called *Foraminifera*[2], build for themselves as the shell fish do, a kind of a house, made of a kind of a hard shell. As they exist in such enormous quantities, they cover the whole floor of the ocean for very considerable depth. The remains of these animals compose chalk and clay. The mineral substances are created and composed by animal life. Thus a great part of England—the Isle of Wight, the white cliffs of Dover —are all formed of this substance, made up by the skeletons of microscopic beings.

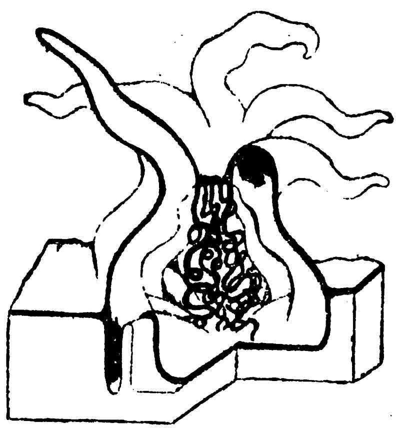


Fig. 10

The third group, is the most important group. These

1. The *mollusca* is an invertebrate animal phylum that has six classes. It is very difficult to define because the term encompasses a great variety— snails, winkles, limpets, slugs, octopus and squid.

2. *Foraminifera* is a class of protozoa classified under *sarcodina*. It includes mainly marine species some of which are planktonic. However many live on the sea bed. The many chambered shell is produced by adding new chambers in a variety of formations as the animal grows. *Globigerina* is a spiral form present in plankton in large numbers. When the animals die and sink, their shells form the main part of the calcareous ooze covering vast tracts of the ocean floor.

animals called *corals*[1], (Fig. 10) are easily found. They are not individual beings. They do not detach themselves from the being which has given them life, but remain to form part of it, in the same manner more or less as the branches of a tree remain attached to the trunk which created them. Corals extract from the water the hard skeleton which they build for themselves. All these skeletons (made of mineral substances) grow, but they always remain attached to one another. The interstices[2] slowly fill up. The great mass grows to such an extent that it occupies an enormous space in the ocean. Pieces broken off by gales are thrown upon the topmost layer of the coral. Gradually islands are formed. Sometimes groups of coralsgrow along the coasts of continents, and form reefs. Such is the Great Barrier Reef along the coast of Australia. Coral Islands are said to be very beautiful. They may support the growth of plants. The plants reach the islands by different means. For instance the sea may carry along a coconut, which may be thrown on the shore of a coral island. Thus, a coconut palm may come up. Very often, writers describe these islands as garlands thrown upon the ocean, a circle of flowers[3] in the middle of which there is a lagoon.

---

1. The *coral* is the solid support or hard skeleton of solitary or colonial members of the class *anthozoa.* Each species of coral has a recognisable form which depends on the growth pattern and the polyps arrangement. The tissue contains calcareous spicules or horny material which provides the inner skeleton. Coral islands or reefs are formed from the petrified calcareous skeleton of the coral polyps. Their growth is restricted by many circumstances. Warm salt water which is clear and shallow with plenty of food and light is required as the polyps live in symbiotic association with algal plants.

2. The narrow, small spaces between the component parts of a body.

3. In the course of this lecture, Dr. Montessori evidently held up pictures of many of the things she refers to — coral reefs, shells, palm trees, etc. At this point in the original manuscript there is a direct reference to one of the pictures.

All the continents, and perhaps even the earth upon which we dwell, has been built up by animal life. This idea appeals to the child's imagination. There are a great number of such islands today in the Pacific Ocean. Without them it would not be possible for aeroplanes to cross from one side to the other. If we were to calculate from the islands which have risen to the surface of the sea so far, we may conclude that the extent of the continent being formed under the water is larger than Asia. If we undertake the study of mineralogy, the study of the components of the earth, we see that a great portion of this land upon which we live today, has been built up by the living beings of the sea. All the great rocks are only cemented masses of shells which some time have been broken up. So there are animals which carry out this immense function of rebuilding the continents, rebuilding lands which the elements and the water are destroying. As the water is recycled, the earth too is recycled, and so too is the calcium carbonate!

The animals which absorb the calcium carbonate have a special characteristic — they are very heavy. This function has nothing to do with their own life. Is it not absurd that a creature which lives in the water is so heavy? Lightness is certainly necessary to live in the sea! For instance jelly fish are very, very light, of gelatinous structure. Although shell fish are vertebrates, they do not possess bony skeletons, but have cartilaginous vertebrae. So these animals which gather upon themselves a heavy mass of calcium carbonate, seemingly act illogically, for they do not need these defences. The calcium carbonate which they absorb is very heavy. In order to compensate for this, their skeletons are not made of bones but cartilages.

There are certain molluscs, which have very heavy shells, but no arms or flesh. In order to build these shells for themselves they absorb water very rapidly, in very great quantities, comparable in human terms to a man drinking eight gallons of water in one second. This water is circulated and eliminated but the animals retain all the calcium carbonate absorbed. The *foraminifera* perform the same function. They keep drinking the water in order to accumulate calcium carbonate, until they become so heavy that they drop to the bottom of the sea. Corals, the tiny living flowers of the sea, are so delicate that they can go on building and creating a continent.

The natural function of a living creature, we might say, is to find food in order to live, and to reproduce their kind. However in the case of these animals, their main task, is to purify the water from calcium carbonate and to render the water free so that life may continue. If life were extinct in the ocean, life would also be extinct in the rest of the world. So the functions of these simple beings, the lowest in the zoological scale, is not merely that of feeding themselves and reproducing their kind. As soon as an animal is dead, these creatures start their work. When only the bones are left, the white ants come and clean the bones entirely. It is evident that these animals accomplish work which must be done.

The sacred green scarab[1] of the Egyptians, has been given the task of cleaning the roads of the world! There are a great many animals in the world, large and small, which naturally eliminate the remains of their last meal. These remains would poison the air. These little scarabs collect all the dirt left by the animals, make little balls out of them, and bury them carefully in the sand. So these workers

---

1. The *scarabaeus sacer*, a beetle belonging to the *coleoptra* family, feeds on the dung of herbivores. It rolls balls of dung into special underground chambers. Within each of these balls of dung, the female lays a single egg. The Egyptian scarab seal was used to impress upon sealing clay. Few scarabs were used as amulets. Scarabs were made of paste, terra cotta, soapstone, wood and more rarely silver or gold. To the Egyptians, the scarab symbolised eternal life.

are in a sense, cosmic workers and their work is the construction of the world. Just as there are workers[1] who carry out tasks in the world of men — sweeping the streets or cleaning the sewers — with their hands, there are animals that have no hands, that do everything by eating. So in the case of many animals, feeding is the task which has been allotted to them — the work that they carry out in the service of other forms of life. We could never despise these animals as gluttons, saying to them — "You are upon this earth only to feed!" Certainly their only task is to feed. If they did not feed the worst would happen. We cannot say to these animals — "Please become vegetarians! If you eat meat, you will become ill! There are toxins in rotten flesh. If you eat it, you will die!" If they did obey such a well-wisher, it would be the biggest mistake, the worst that could happen, because the earth would thus lose its purifiers.

The cow[2] a friend of ours, is a very singular, a very strange sort of animal. She continuously chews green grass in the fields. If we watch her, we can see that she is always chewing. The strong well-armed cow has existed as she is, for centuries. She has very large teeth and cuts the grass like scissors just near the roots. Yet she never uproots the grass. Is it not strange that such a big animal is so delicate? Now, it is common knowledge that in order for grass to grow well, it is necessary to press the earth, and to cut the grass close to the roots. We use lawn-mowers to regularly check the growth of grass. This not only keeps the plant alive, but also helps the roots multiply. Instead of growing and drying after seeding, by constant mowing,

1. In the original manuscript, Dr. Montessori uses the word servants. It has been replaced wherever necessary with the more appropriate term worker. Also see Chapter 16.

2. In the original manuscript Dr. Montessori distinguishes between cows in India which are very "dainty and delicate" as opposed to cows abroad which are "big, strong and with enormous horns."

the grass roots spread underneath the ground and multiply. Now, green grass is one of the constructors of the earth, one of the builders necessary for other plant life. The aid of some machine is required to do all the work, to keep the earth firm to enable other vegetable life to grow. That is why the cows do the work of lawn-mowers, and eat the grass, cutting it near the roots.

For centuries and centuries now these cows have been chewing and chewing. Do cows like to chew grass? Why do they eat only grass? There are all kinds of theories! Perhaps the cow did not like this food, and it made her sick to eat grass. Yet she said — " I have to make an effort to eat grass ! " The cow is a marvellous laboratory. She gives milk, which is sweet and abundant, and she creates it out of the grass she eats. She has even developed four stomachs for digesting grass. The cow is capable of giving milk for a long period from the time of the birth of the young, longer than other animals. Is it not marvellous that through the centuries the cow has persisted in eating grass to keep on doing the work which is necessary for the formation of the earth? She is a big animal. She has large teeth, and is very active, free to feed. There is no one to stop her from chewing something other than grass. Why should she sacrifice her comfort and eat only grass? There can be only one answer. All the animals are faithful to the work which has been allotted to them and each one of them persists in it, for it is necessary for the upkeep of harmony upon the earth.

CHAPTER 24

The cosmic function[1] refers to that which concerns the building up of our world. Man also has a cosmic task. When we talk about living beings, we must look at things from the point of view of geology, and not just biology. So we must consider this energy of life in relation to the building of the earth, our planet. When we study life geologically, we see that each form of life has a higher function than that which is generally considred in biology; a higher function than to attend to its own life, or to the life of its own species. This higher task undertaken by each living being is its cosmic task.

This way of looking at things sheds a new light upon evolution (Fig. 11), and gives us a different orientation. The

---

1. Dr. Montessori duly notes at the outset of this lecture that she has used the term cosmic task to refer to what should more accurately be called *Telluric Economy*. The word *telluric* pertains to the earth and is derived from the Latin word *tellus* meaning earth. The original reference to *Telluric Economy* and its definition remains elusive, although Dr. Montessori's explanation of the cosmic task in this lecture is clear.

Era	Period	Began million years ago	Development of Life
Cenozoic	Quarternary	2	mammals, man
	Tertiary	65	flowering plants, hoofed mammals, primates
Mesozoic	Cretaceous	135	flowering plants, mammals, birds
	Jurassic	195	reptiles, birds, coniferous forests
	Triassic	225	mammals, reptiles
Paleozoic	Permian	280	modern insects, life abundant
	Carboniferous	345	reptiles, winged insects, ferns, horsetails
	Devonian	395	fish, amphibians
	Silurian	430	seaweeds, land plants, jawed fish, sea scorpions
	Ordovician	500	corals, trilobites
	Cambrian	570	sea urchins, graptolites
Pre Cambrian		4600	bacteria, algae

Fig. 11

theory of biological evolution[1] is built up merely on the observation of living beings. In the beginning these living forms were only simple beings. With the passing of time, the animals became more and more complex in their organisation, until they arrived at the relative perfection of today. Many facts to prove this theory can be found in the studies of the earth. The conditions of life became more complex and so also the organisation of the animals in the different periods became more complex. Adaptability to the environment is thus controlled by two great urges — the conservation of the individual, and the conservation of the species.

Why then, should there be unicellular beings which have not undergone any evolution? Why have they remained unicellular beings? There is after all a vast difference between the unicellular beings that evolved first,

---

1. The history of the earth is one of ceaseless change. This is true of the plants and animals that inhabit every corner of the earth — from mountain heights to ocean depths. The way living beings have changed since life began is the story of evolution. We do not know how life began. it is believed that all living beings arose through a long history of changes shaped by physical and chemical processes that are still taking place. It is plausible that all organisms can be traced back to the origin of life from inanimate matter. Exactly how evolution occurs is still a matter of debate. That it occurs is scientific fact. Evolution has no apparent built-in direction or foreordained purpose. Changes that occur in living organisms serve to increase their adaptability, or potential for survival, or reproduction, in the face of changing environments. A given kind of organism may evolve only when it occurs in a variety of forms differing in hereditary characteristics or traits that are passed from parent to offspring. Purely by chance some varieties prove to be ill-adapted to their current environment and thus disappear, whereas others prove to be adaptive and their numbers increase. The elimination of the unfit or, " The survival of the fittest " is known as *natural selection*, because it is nature which discards or favours a particular variant. Basically evolution takes place only when natural selection operates on a population of organisms with diverse inheritable forms.

and the other beings which came much later and evolved with such rapidity!

The fundamental fact on which all life in the water (as well as on land) depends, is that the different elements must be separate from the other elements. If it were not kept so, we would go back to chaotic conditions. Without air, life upon the earth would not be possible, because the living beings could not breathe. The water must be separate from the earth. If the two were mixed up, we would have mud instead of water. So since the creation of the earth, living beings have needed air and water, to be kept separate and pure. Water brings calcium carbonate from the earth into the sea. These salts are poisonous. It is therefore necessary to have an agent to purify the water. So the function of these unicellular beings is to eliminate the poison from the water. They do not live just for the sake of living. In studying the story of the earth, we see that their function is to make a kind of shell for themselves with these salts, thus eliminating them from the water in which they were dissolved. At that time, there was the earth, from which the calcium carbonate was washed down into the waters. There were also unicellular animals which could eliminate the salts of calcium carbonate. This was the beginning of contructive creation.

There is an epoch[1] in geology in which the only living form was protozoa. A long period of evolution followed.

1. The most direct proof of evolution is furnished by the science of paleontology, the study of life in the past through fossil remains or impressions in rock. Geological time units are specific segments of time distinguished on the basis of rock succession. A fossil can be related to a specific epoch by inferring and interpreting its position within a rock succession. In the table (Fig. 11) we see the successive periods discussed by Dr. Montessori in this lecture. Here she specifically refers to the Cambrian period of the Paleozoic era.

In the first part of the second epoch, a new kind of animal evolved. Geologists call these creatures trilobites[1]. (Fig. 12).

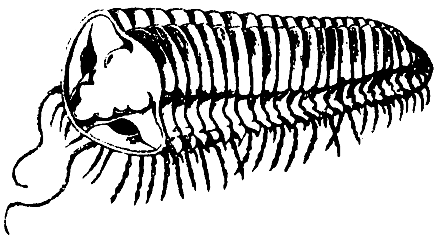


Fig. 12

They were very complicated animals that had three lobes very big eyes and legs. There being no other form of animal, life, this creature became the king of all the water.

A new period[2], a new epoch began. More land came out of the water. The more the land, the more the calcium carbonate. The protozoa could no longer fulfil their task. It appears as if the intelligents of the time had a committee meeting to decide what to do. They observed the trilobites and said to them — " You do not know how to do your work. You take too much time to put your big eyes into action. We do not need intelligence or complexity of organisation here, but only hard working people. You are merely walking up and down and not really working. We will seek the help of some other life form ! " It was essential that the waters of the sea remained pure. It was not essential that the trilobites continued to reign supreme. It was not at all necessary that the trilobites evolved and became still more complex. What was necesary was the upkeep of the first level of creation, the maintenance of the purity of the water, and to keep back the chaos which threatened.

1. A trilobite looked a bit like the woodlouse of today. Its body was made up of three parts — the head shield, the thorax and the tail shield. The thorax had many segments below each of which was a pair of legs. The trilobite also had paddles with which it swept foodtowards its. mouth.

2. Dr. Montessori refers here to the Ordovician period.

So it appears that in that great committee meeting the intelligents said — " Well let us assemble all those who are suitable for the work and select the ones who are the best."

Something curious resulted from this. Instead of more complex life forms, the next period saw less complex ones. Many different groups of these beings evolved because there was evidently more calcium carbonate to be eliminated. There evolved wonderful beings called carneous. Although they were animals, they were the palms of the sea, with long tails and big leaves. These creatures had flower-like and fruit-like excrescences, which when the carneous died, fell to the floor of the ocean. These deposits are among the most beautiful forms of creation. The trilobites thus began to lose their power, and became less in number. Then the molluscs appeared. Characterised by these great quantities of secreting forms of animal life, it was in this epoch that for the first time the corals made their appearance. This was called the Silurian[1] epoch. So instead of evolution, there was retrogression, as these animals were more suited to absorb the calcium carbonate rapidly. So there came about an immense increase in the number of these beings, who vied with one another to see who could take up more calcium carbonate.

If we consider things from the point of view of evolution or the complexity of construction, we find that gradually the trilobites which were so complex in their construction and so well-formed disappeared entirely. We also find that the more complex forms of the carneous, the trees of the ocean, also disappeared. These species became extinct. Only the corals, very simple life forms which could multiply easily remained. The committee which had called forth all the life forms to show their ability, chose the corals to rebuild

1. This period saw the first appearance of land plants. Corals and molluscs flourished. Shallow water limestones with flora and fauna were evident suggesting a wider tropical belt.

those rocks and lands which had emerged from the sea, which were slowly being destroyed. This work was very important, so the corals which could do this work were of primary importance. The molluscs remained but they were of secondary importance. The protozoa alone remained from the very earliest times. They were simple, yet they carried out their task efficiently and were useful. All the others were eliminated. So the survival of a species corresponds from this point of view, to the continuation of their utility for the upkeep of the Telluric equilibrium. If a species, is very useful, although very simple, it remains. It does not evolve, but it does not disappear.

Now we pass to the next epoch — the Devonian[1] epoch· The corals with their rapid multiplication and distribution created certain problems. Having chosen the best place, they remained always fixed there and did not move. These corals were in need of calcium carbonate in order to go on living, but they could not move to get at it. How could the calcium carbonate be brought to the corals?

Sea water is in continuous motion. Both the sun and the moon work together in order to keep this agreement and thus the water moves in a great mass. From the beginning of their existence, the corals needed more help than that offered by the sun and the moon to have the calcium carbonate brought to them. To keep calcium carbonate evenly distributed in the ocean, the water needed to be beaten continually. How could the sea water be continuously stirred? Sugar or salt can be dissolved in a glass of water by stirring with a spoon. Otherwise the salt or sugar will remain in one place undissolved. As it was essential for the equilibrium of nature to be kept, another committee meeting was called. If the corals died out, the calcium

1. In this period of great changes the trilobites declined and the earliest vertebrates, fish began to appear. Molluscs and corals were abundant.

carbonate would poison the water. In order that the corals carry on their work, the calcium carbonate had to be brought to them. So the need for other beings to help these corals arose.

Immediately, a life form presented itself, an animal ready to carry out the task of beating the water. This creature looked like a warrior of the middle ages. It had strong arms and said — " With these two strong arms of mine I am going to bring the calcium carbonate to the little corals." He was covered with a great shield and proved very heavy and unyielding. After trying him for a while, the committee said — " You may be strong, you may be armed, but you are too heavy to serve our purpose." So this species was short-lived. It disappeared and no trace of it was found afterwards[1].

Then another kind of animal presented itself, but its first concern was for its own defence. For this it had a kind of a shell on the top, and it moved very rapidly because its arms were very free. In the beginning this arrival seemed more suitable for the purpose than the first kind, but later on it was also found to be unsuitable because great muscular force was needed to make the sideways movement necessary to keep the water always in motion.

So an agile being which did not need a hard covering, was found and chosen — the fish. They were found to be good and remained. So there was an immense multiplication of fish, all kinds of varieties, all kind of forms, but retaining the same construction and the same muscular movement. They stirred the water constantly while they moved. Instead of being heavy and armoured, they were light and

---

1. Perhaps Dr. Montessori refers here to the prehistoric scorpion, a large creature, often two to three metres long, which lived in the water. Its body was divided into many parts. and protected by a thin shell. In front of its head it had a big pair of claws with which it caught its food. At the end of its body it had a flat appendage which helped it to swim.

almost transparent. The committee said — "This is just what we were looking for! Now, we must do something to keep these beings moving all the time." So each fish, afraid of being devoured by a larger fish, in order to save itself, had to continuously move.

The poor little fish held a meeting of protest. They said — "Is this the way to protect us? We promised to serve you, and you take away all means of defence from us! How are we to defend ourselves? We have no grotto in which to hide. We have no arms. We cannot build houses like the shell-fish. We shall be destroyed by the larger fish! Is this the way to treat us, your servants that serve you and help you?"

So the committee said — "Now, what shall we do? Most important is the water. It must be kept pure and in constant motion always. So the best course would be to give the fish the power to multiply in enormous numbers. Instead of producing one or two children, the fish shall have ten million children, so that even if some of the little fish are destroyed, there will still be plenty of workers left."

So the fish began to run away from each other. Each of them, in trying not to be eaten, and in trying to get food, kept playing in the water, swishing without rest, and thus kept the water in constant motion. So the stately corals, steadily fixed in their place, were served, while the fish rushed around in a frenzy, bringing the calcium carbonate to the corals, to be devoured.

Human beings in certain parts of the world, often express their happiness by saying — "We are as free and happy as fish." Certainly the fish are free. They can go anywhere they like, up or down or sideways. However, when we examine them carefully, we see that they distribute themselves in the water in a marvellous fashion. Some fish like to live near the coasts. Some of them live close to the surface of the water, and others half-way down.

Some others like to dwell in the dark recesses at the bottom of the sea. They do what they can to defend themselves. They band together, an army of fish moving in shoals, and multiply in great numbers. The fish are free, but there are a great many fish. If all the millions of eggs developed, and all the little fish became big fish, there would be no water left in the sea. To eliminate that danger, there are beings in certain parts of the world which destroy the little fish in large numbers. Down from the cold Poles, come enormous monsters, the whales. They simply suck into their mouths millions of the little fish. They do not eat the bigger fish, only the small ones.

The study of life in the ocean and the equilibrium which is kept constantly in every sphere, the animate and the inanimate, is marvellous. We can say that the problem of the water has been solved — the equilibrium has been kept. Neither the corals nor the fish evolve any further. They remain as they are because each of them accomplish their own task. As long as the equilibrium is kept, the conditions of things remain the same. It takes a great revolution in order to bring a change into the conditions of life.

We then enter into the Carboniferous[1] age. It is in this age that plant and animal life appeared upon the earth. From this time things remained the same. The enormous development of vegetable life upon dry land which occurred was very significant. We might compare the importance of the plants upon the earth, to that of the corals in the water. They are similar not only because they remain fixed in the place in which they are planted, but also because of their task upon the earth — the purification of air. The air which we all breathe, which allows us to continue living, is pure due to the work carried out by the plants.

---

1. In this period there was widespread growth of forest. Coal formed in this period is found on all continents. There were many swamps, and much volcanic activity.

Upon the earth, things are not the same as in the sea. The conditions are different. The plants do not accumulate in great numbers like the corals. Each one is individual. Nevertheless, they cover the whole of the earth, and assume a colour in relation to their task. Curiously, the plants gather and build great masses of carbon from the environment. We know these masses as coal, a pure form of carbon. Another unbelievable task of the plants, is to accumulate iron. By making these great deposits of carbon and iron in the earth, they purify the air.

Certainly each individual form of life has its own characteristics, its own urge for the conservation of the species and the individual. Yet all these various tasks — the task of the corals in reconstructing the earth masses, the task of the plants in eliminating carbon dioxide to purify the air and accumulating the carbon and iron to deposit in the earth, the task of the fish in stirring the water of the sea in order to serve the calcium carbonate to the corals — are not done by these creatures for themselves. These functions do not belong to their life. They do these tasks with a greater aim, for a group greater than their own. Together they form nature. They represent creation.

Evolution took place in the water until equilibrium was reached. Upon the land, another evolution started. Animal life began. How marvellous creation is! Before animal life started upon the earth, there were already plants in great numbers to keep the air pure. So we see a logical progress. The study of evolution acquires meaning only when we look at the whole. Only when we look at the whole, can we see in the evolution of all life forms, their cosmic function. The corals build up continents. This is their cosmic work. The earth yields iron. It has been placed there by the cosmic work of the living plants. The earth is full of coal deposits. These deposits are the result of the cosmic work carried out by the plants, which took away the poison from the air, and buried it in the earth, where it became coal.

Thus each being, for the great part of its productive life, lives only to do the cosmic work of the earth. No being is placed upon the earth merely to enjoy the conditions and the fruits that the earth gives. Evolution cannot be explained if we look upon the work of each life form, as being done selfishly for its own ends. What is of interest is to observe and to understand that each of them, the smallest as well as the biggest, the simplest as well as the most complex, has a significant function, a cosmic task, which helps the preservation of the equilibrium of the whole.

CHAPTER 25

Upon land, the function of purification is reserved exclusively for plant life. Before any form of animal life began, before there was any need for respiration, plant life was already there in luxuriance. Therefore the purification of the air had already started before animal life appeared. The plants cannot carry out this task by themselves. They need the help of the sun to carry it out. That is why the plants do their work only during the day. Carbon dioxide which renders the air noxious, is formed of one part of carbon, and two parts of oxygen. Under the influence of sunlight, the plants hungrily absorb the carbon dioxide, split it into two parts, keep the carbon and give away the oxygen. On the other hand, we have animal life which does the opposite. The animals absorb the oxygen and give out carbon dioxide. So the animals poison the air, and the plants purify it again.

This phenomenon is studied as a relation between vegetable and animal physiology. However, this function cannot be understood if we consider it only as an exchange between the plants and the animals. The plants are in such an enormous quantity in comparison with the animals, that the number of the animals is insignificant. Therefore, the plants do not purify the air for the animals alone. The plants serve the earth. They serve the animals inasmuch as the animals form part of the world.

Let us think of the earth itself, which breathes continuously emitting enormous quantities of carbon dioxide. A volcano, for instance, is the most stupendous example of breathing earth. The little fish that are in the water continously emit carbon dioxide. The water that goes underground is full of carbon dioxide. As it comes out, it leaves the carbon dioxide in the air. So even the water is a carrier of carbon dioxide. So it is the task of the plants to absorb, not only what the animals emit, but also what all the earth emits in such a stupendous quantity. The plants drink in the carbon, and form out of it their own bodies. When we burn a tree, what do we burn if not coal? So in studying the physiology of plant and animal life, there is certainly no exchange. The plants from this point of view, have the cosmic task of keeping the air pure and helping in the creation of the land.

In what part of the earth are the roots of the tree embedded? Certainly not within the rocks. The part of the earth in which the plant grows is the black earth, the humus. Who has made this part of the earth? It has been made by some form of life. Humus is composed of the remains of many other forms of life, and all kinds of bacteria.

The water, we might say, is always the same. It remains always the same. The fish keep stirring the water. This is also necessary upon the earth. So there is a certain primitive form of vegetable life which prepares the ground for the growth of a more evolved form of vegetable life. Besides the immense task of keeping the air pure, the plants also have another task of preparing the very earth on which the plants grow. This can be seen very clearly in parts of the world where there are regions under formation. For instance, in Holland, the sea forms enormous masses of sand called dunes[1]. The wind would scatter these dunes away

1. Sand grains are finer than gravel but larger than those in silt or mud. The wind blowing steadily in one direction may move huge quantities of sand. Sand grains are blown along just above the ground. They cannot rise to cross an obstacle. In this way sand piles up on the coasts forming mounds called sand dunes. The wind blows the sand up the beach from the sea. Sand dunes often form behind beaches. Although coastal dunes are common, sand dunes are usually found in deserts.

immediately, if the seeds of a gramineous[1] plant did not spread all over the dunes, and take root at once. The roots of these plants make a network, spreading and multiplying so as to keep the sand from being scattered by the winds. When these plants die, they form a sort of cover, a shell for the sand so that the wind may not get at it. On top of them, other forms of plants start to grow. Soon after that, grass comes up. This renders the whole dune firm, making a green lawn. This is extraordinarily interesting. We must always have a piece of lawn to show the children. How did the tall trees grow and live? Who made food for them? It was these successive forms of life that made it possible, for trees to live. We say that the seed drops into the earth and the plant grows and feeds. However, it is not as simple as that. The plants work in order to construct the very earth upon which every plant will have to live.

The energy, which is life, works in order to build up the world. It is not life which lives at the expense of the earth, but the earth which lives at the expense of life. Many animals do this work. For instance, an enormous number of the long and slender little animals called worms[2] inhabit

---

1. The low, green, non-woody, flowering plants belonging to the *gramineae* family, horizontally spread perennials that form either dense or loose ground cover. Grasses invade new habitats readily and spread rapidly filling many ecological niches. They trap loose sand or sediment. With their dense, extensively branching fibrous root systems grasses foster the activity of microbes, invertebrates and rodents ensuring the availability of water and nutrients to the vegetation above ground. The death and decomposition of these plants lead to the accumulation of considerable organic soil matter and high soil fertility.

2. Earthworms are terrestrial annelids, segmented worms belonging to the class *oligochaeta*. They play a significant role in improving the soil. Their burrowing allows more air and water to reach deeper in the ground. They aid the soil by feeding on decaying organic matter by swallowing the soil containing it, depositing the bulk of the soil as waste called castings on the ground. Earthworms ingest and discard their own weight in food and soil everyday. This exerts beneficial effects on plant growth. Their activity aerates the soil and promotes drainage.

the earth. We cannot dig a little bit of black earth without finding at least ten or fifteen of them! Without these worms there could be no fertile land. These animals are devourers, absolute gluttons. Nothing can stop them from feeding. They eat continuously. They have a very quick digestion, otherwise they could not go on eating. Curiously they eat nothing but common earth. How do they hungrily eat so much dry earth? These poor worms are not gluttons, but merely workers, continuously working with their own bodies to make the land fertile. Now theorists explain that these animals have adapted themselves to their evironment, they have adapted themselves to eat the earth. The world is so full of many other things that they could eat! Why should they eat the earth, and in such enormous quantity?

The adaptation of certain insects to come to the aid of plants, is of great interest. For instance, bees and many other insects[1] are attracted by the sweet nectar that is found inside the flowers. The bee is a great worker. It is covered with beautifully coloured fur, (everything in nature is beautiful !) which is of no use to the bee. When the bee goes into the flower to suck the honey, it catches the pollen of the flowers, and carries it to another flower which it visits in quest of nectar. Thus it helps the flower to develop into fruit. Why should the bee be covered with fur of which it is not even conscious? It is only in order to carry out its cosmic task. The adaptation and the modificatons in the form of an animal can occur only if the animal needs to

---

1. The relationship between the flowers and the bees represents one of the most refined forms of accomodation between two living creatures. Bees assist in the process of pollination, by which pollen grains are transferred from their production site on male structures to a receptive female site near an ovule, a future seed. Flowers pollinated by bees attract insects by their colour or scent. Bees, which co-evolved with these flowers, possess long tongues for reaching the nectar inside the flower. The pollen collects on the bristles on their legs and is carried to other flowers. Flowers may be pollinated by beetles, flies, butterflies, moths and bees.

adapt itself to its environment. No such need for the bee exists. It does not know that it is helping the development of flowers and the reproduction of plants. So this adaptation has been in service to another form of life, an adaptation of which the bee itself was not conscious.

There are upon the earth everywhere corpses of animals that die every minute. These corpses must be destroyed or buried. There are certain animals which have taken upon themsevles this task. Some human beings bury the dead, and some burn them. We use our hands to carry out this task. The animals have not got hands, and yet the task is one which must necessarily be carried out. So let us examine how these animals carry out this task that they have taken upon themselves. There is a very, very, large bird[1], larger than the eagle, which has a long neck. This neck is completely naked. At the base of the neck, there is a beautiful collar of white fluffy feathers. Theorists say that these birds have developed a long neck because they have to thrust their head deep into the entrails of dead animals, so that they can tear them out. It is very curious that men who embalm the dead bodies first take out the entrails. These birds do just that. After it has done its work there are other animals which come and eat the flesh. We can always locate a dead animal, because we can see these birds hovering in the sky, high above the body. Despite what the theorists say, we may ask ourselves — " This bird is very strong. It can lift a dead cow and carry it from

---

1. The vultures are large birds of prey of ancient evolutionary origin. They are linked genetically to storks. Their head and neck are bare except for a thin covering of down. They have a highly developed eyesight and a keen sense of smell. Their beaks are heavy and strong adapted for tearing hides and meat. They have along broad wings arnd can soar gracefully remaining aloft for hours. Vultures are scavengers. They eat garbage, excrement, carrion, eggs or insects. They rarely prey on live animals. One vulture will bring down a whole pack of them in its wake. Vultures prefer mountainous or open country.

one place to another. It has such an enormous beak that with one stroke it can part the skin of a dead animal from one end to another. Why does it not eat something other than this rotten stuff ?" Certainly this work is not done by this bird for its own pleasure. After all, it is a strong bird, a ferocious fighter !

It is not generally considered that the different living beings do not live for themselves, but for a task so enormous, that even if they were endowed with consciousness, they would not be able to grasp it. If we could communicate with a coral we could ask — "What is your greatest desire in life ?" It would probably say — "I would like to have calm, warm waters and peace in which to live. I would like to multiply myself. I would like my family to grow." These corals like to live well. They like to have the luxuries of life. They like servants, other beings who by symbiosis prepare their food. If we were to ask — "Are you satisfied ?" They would say — "Oh, I am perfectly satisfied ! My family is always united. We have plenty of food, and a beautiful environment. We are absolutely happy." We could ask — "Do you not even suspect that you have the great task of rendering the water free from poison, and that to sustain the whole world you are building continents ?" The coral would just gape at us and go to sleep. It would not be able to grasp what we were saying.

We could tell the shellfish — "What a great sacrifice you are making ! You drink this enormous quantity of water and drop down dead at the bottom of the ocean !" They would reply — "Do not talk of us as great heroes ! We like to drink. It is our pleasure." So we see that each living being has a function that it is conscious of, by which it is satisfied. It is necessary that the conditions of life required by each kind of living being is fulfilled so that it can carry on the immense task of which it is unconscious. It is when each living being is at the height of its pleasure, at the height of its satisfaction, when all its ambitions in life have been achieved, that it is carrying out its cosmic task.

We perceive that animals live at the expense of the environment. This is the expression generally used. It is true. These animals create the earth. From this point of view, every animal which lives at the expense of the environment, has another greater task. It is one of the active agents of creation. Therefore, life is energy, an energy necessary for the upkeep of nature, and the upkeep of the world· The idea that the water is meant for the fish because they live in it, and that the earth is meant for the animals as the animals live on it, that their greatest task is to find food for the upkeep of the life of their species, and that in order to do this, that they have to adapt to their environment is only a small detail, part of a larger picture.

It is evident that the simple task is the means for all living beings to do their task, but it is not the task itself or the end. If life is considered in itself, as separate from the cosmic task, it appears different from when it is considered as a part of the universe, as a part of the whole. Would it not be interesting to study biology again, either aimal forms or vegetable forms, to try to interpret each one according to its task of keeping alive the rest of life?

If all these life forms have another function besides that of feeding and reproducing themselves, a function which leads to the upkeep of the equilibrium of the world, we could then ask — " Does man have a cosmic function in this world? Man, is the most intelligent being, who of all the forms of life is the best endowed. Should his task merely be to walk up and down the earth and do nothing ?" Examining human life in the past and in the present, we certainly cannot say that man's task upon earth is merely to walk up and down and enjoy it. Poor man ! He has to struggle so much in the world! Does man work so hard oly because he has to feed himself, and provide for his family? Is this only task the upkeep of his family and his race ? Not even the shellfish work only for that !

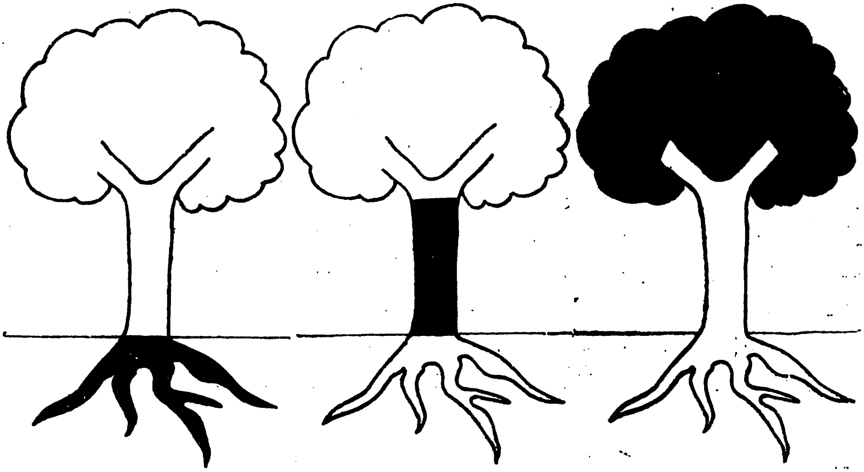
If we merely study the forms of life from the point of view of their complexity, or the construction of their bodies, we cannot understand anything about life. Each form of life has its cosmic task. Each one is related to the task of the other. The common aim is the upkeep of the earth, the upkeep of our world.

CHAPTER 26

When the child comes to one of our schools, he already possesses a language, while he does not possess any knowledge of mathematics. So the teaching of language presents different problems from the teaching of mathematics. Language should therefore be approached with a period of preparation, which lays an interesting basis for what is to follow. Around the age of three, when the child who cannot read is building his vocabulary, when he is hungry for the language, we must present new words to him, and thus offer him an indirect preparation for reading. In this sensitive period, the young child enjoys learning these new names, but if they were offered later on at the age of seven, he would find them terribly boring. There is nothing more boring for the child than to do something which is suited to another sensitive period. We must realise what careful preparation is necessary before the child can arrive at reading. We must therefore capture the interest of the child, and direct it through the right channels. The child likes learning the names of all the different things which he has seen and knows. He is attracted to the names. We must thefore offer the words not just in any order or by chance, but by classifying them according to the various subjects, as elements of biology, geography, physics, or chemistry. Usually we offer the same material to the whole class, consisting of children of mixed ages, from three to six years of age. Each child sees only that which is of interest to him.

We can suspend the roots of a plant using a piece of wood with a slit in the middle, in some sufficiently large bottle. The roots should not be cramped. The piece of wood must also have a round hole through which a tube of glass can be inserted. Every day, we can blow some air into the bottle so that the roots get oxygen. We must keep the bottle wrapped carefully with either felt or black paper, so that light may not pass in, otherwise the water will turn green and the plants will die.

When the child takes off the wrapper and looks at the roots, he feels as if he is opening a new book. There is great joy and interest. A child of three may merely be interested in the parts[1] — the roots, the stem and the leaves.



roots stem leaves

A child of five years is interested in the botanical classification of plants more than in anything else. He may examine the

---

1. At this point of the lecture the picture of a plant was held up to the students in which the parts of the plant, the roots, the stem and the leaves were highlighted in yellow, red and green respectively. Today, four parts of the tree are highlighted — roots, trunk, branches and leaves. A picture of the entire tree is also included, painted as naturally as possible.

root to see if the plant is a Monocotyledonous plant or a Dicotyledonous one. The Dicotyledonous plant has many roots called secondary roots, from which other little roots come out. The Monocotyledonous plant has only one seed-lobe, and the plant has a bunch of roots. All of them are called secondary roots. The primary roots die immediately, and a bunch of roots of the same size and of the same thickness grow under the earth. There are different kinds of Monocotyledonous plants. The rice plant is one of them. All herbaceous plants are Monocotyledonous. A child of seven is interested in the physiology of the plant — the how and why of things. Dicotyledonous plants have roots and branches, which are just like the branches of the tree while the Monocotyledons do not have branches. The leaves of the Monocotyledonous plants have veins that run parallel to each other, while the leaves of the Dicotyledonous plants have a network of veins.

In two large bottles, we can suspend in the same manner two of the same type of plants. The seeds of these plants should have been sown on the same day, under the same conditions, and the plants should have sprouted on the same day. The solutions in the two bottles in which the plants are suspended should be different — the salts needed by the plant should be lacking in one bottle but included in the other. The plant which is suspended in the bottle without the salts it needs, may suffer in its growth. It may become pale or stunted. It may become sick or turn mildewed. The plant that flourishes is the one that has the full complement of all the salts. When the plant is put in a weak solution, or in pure water, the roots grow longer and longer seeking food. If we include the full complement of salts in the solution in which the roots are, they grow sideways in great bunches to find as much food as possible from the solution.

This material interests all the children in the class from three to seven years of age. This is material which has life.

It is always the same plant that all the children study, but to children of different ages it presents new aspects, and has a different appeal. When the roots of the plants are underground, the child cannot see them. In order that the growth of the roots may be seen, the plants are kept in transparent glasses. So when this material is shown to the young child he is very much interested in seeing the roots of the plants which he may not have seen before.

We present a diagrammatic representation of the whole tree (Fig. 13) in order to give the young child the names of the different parts of the tree. As in the other materials, we follow the principle of the isolation of detail, the materialisation of one abstract idea. To isolate one part and throw light upon that part alone we must colour it brightly, and leave the mere outline of the other parts. Then the child is given the names. The roots are represented in one picture in a bright colour, while the other parts are indicated by a mere outline. The stem stands out in another picture by bright colouring. In the third picture there is the leaf isolated and distinguished from all the rest of the picture. First we start with the whole tree, then we go to the details — the root, the stem and the leaf, each one isolated.

Next we can offer the leaf and its different parts. Here too, we isolate the part of the leaf that we want to highlight in red, to attract the child's attention to it. We can also offer the flower and its different parts. First, the whole flower is offered in its real natural colour. Then we present the parts one by one while the other parts of the flower are merely outlines — the corolla, the pistil, and the calyx.

This is not a study of botany, but merely a way to offer the child new names to enrich his vocabulary. The names that we offer are connected with reality, with real objects that exist. As such it is a wonderful preparation for the later study of botany and biology. Besides new names, this kind of study kindles the child's interest in the language, and indirectly prepares him for reading when the time comes.

We can also have pictures of animals and birds. First we offer the child a collection of animals that are familiar to him, and then a collection of birds. Then we can mix these two collections together and bring in the idea of classification, by asking the child to sort out the two categories. We can also offer pictures of unfamiliar animals, along with the more common ones, so that the child learns those names as well.

Similar material is made with the other things in the social environment. We can have the kitchen with all the utensils that are used in it — pots, the coffee-grinder, pans, and jugs. We can have the dining room with the special objects found in it. We can also have a farm with its special features — dogs, sheep, cows, and agricultural implements. Thus an indirect study of social life becomes possible.

We can offer the child material to present elements in geography before the child knows how to read, when he is just three years of age. Clay models, representing land forms pasted on a strong hardboard or plywood base, can be made. The clay must be wetted in order that it may stick on the board. Some oil can be also used so that the clay models do not crack or dry quickly. Two contrasting models are presented to the child sensorially — the peninsula and the bay[1]. They are exactly alike but with one difference — in one model, the outer part is raised, and in the other the outer part is lower. In each case the raised surface represents land and the lower surface, water. The former is a representation of the bay, and the latter is the peninsula. Similarly, we can also present an isthmus and a strait to the child, explaining that an isthmus is a narrow strip of land connecting two large pieces of land, and the strait is a narrow strip of water connecting two large pieces of water. Then

1. Today the five pairs of geography models we present to the child are *lake* and *island*, *peninsula* and *gulf*, *isthmus* and *strait*, *cape* and *bay*, *promontory* and *creek*.

we can present an island and a lake. We present the contrast through sensorial material. We place the models in little trays, and pour deep blue water into it. The water fills all the lower parts till we see water and dry land. The water should be deep blue so that the portion that it covers is not visible.

We also have two sets of diagrams, one set with the name written underneath each diagram and another set where there is only the diagram without any name. Among these also we have the peninsula, and in contrast the bay, the strait and the isthmus, the island and the lake. There are thus two steps. We offer the real experience first, and then its diagrammatical representation. Through this material, the interest of the child for the maps and geography is kindled.

We have three glass-sided boxes. In the middle glass box, there is some water. The boxes are all closed. The middle box is connected with another box by a tube in which there is a red-hot sheet of iron. If, all of a sudden, the communication tube between these two boxes is opened, a jet of dry air passes over the water. This saturated warm air is brought into the third box on top of which there is a thick block of ice. All the hot air becomes cool, and the water drops down in the form of rain. This experiment explains to the child the cosmic reason for rain, as well as the reason why there are deserts. In the dry desert the hot air goes up, carrying the water of the ocean, that it has sucked up. The mountains act as condensers. So when the warm moist air reaches the top of the mountains, it is stopped, and we have rain. The child can hold these ideas firmly in his mind if we offer them to him in a realistic fashion, by means of simple experiments which he sees carried out in front of his eyes.

We must always remember that every item of culture that enters the syllabus must stimulate the child's intellect. Each such item represents one more thing which keeps alive this inner interest and the inner life of the child. We must not become preoccupied with the immediate utility of the item of knowledge, nor must we be influenced by our own prejudices while deciding if a particular item is too easy or too difficult for the child. The real challenge lies in finding a detail which will keep alive the child's interest which will draw his attention and demand his concentration. We might ask — " Why should we waste our time showing these useless things to the child ? They serve no immediate purpose. In any case they may be studied for the sake of curiosity later on ! " Instead, we must only ask — " Is this something which arouses the child's interest ? " If so, we certainly must offer it to the child.

CHAPTER 27

Written language is the representation of the ideas that the child has. The child analyses the words that he possesses in his mind. We offer the child the alphabet as a key to explore the world of ideas that he possesses. Great care should be taken that this alphabet does not become a means of oppression, a means of killing his interest.

Reading is the greatest gift given to humanity because it allows anyone to enter into silent communication with the soul of the writer, to hear the thoughts of people from the past, to feel their emotions. It is after all, only the most beautiful things of the past that are worth keeping, that have been recorded. It opens to the child the whole new world of the past. The child's enthusiasm and interest for reading must not be killed by the offering of stupid details. The interest in details will burst forth by itself later on. We must let the child take his own time and allow him to discover one day that he can read, just as he did with writing. We must not try to teach the child to read the words just because he is able to write. Instead, we must let him analyse and produce his ideas through letters, before he arrives at grasping the meaning of that which is not known to him, which is expressed by letters.

We know that mechanical reading is the interpretation of the sounds represented by the letters. A day will come when the child, instead of composing words, will try to interpret the different sounds of the letters composing words. Sometimes we may even hear the child mumbling the sounds. When this happens, we know that the time to give the child another lesson has come. Six months may pass between the last lesson on language, and the one to be given now. When this psychological moment is at hand, we must start with a word which is very familiar to the child, ensuring that it is simple and phonetically written.

In Holland, some teachers tried to offer the phonetic words first. They did not succeed, because their language Dutch, had very few phonetic words. They complained that the children were not interested in the language lessons. They complained that I could not understand the difficulty in teaching the Dutch language as I did not know it, and that this method was not suitable to Dutch. I went to the school and suggested that if we could find just one phonetic word, even if there was only one such word in the language, we would give that one first. The teacher complied. The word we chose was *mama* which is usually phonetic in every language. The teacher asked the child to read it. The child had understood that reading was to represent the sounds of the letters. The child at first read the sounds slowly one by one. The teacher asked the child to read faster and faster until at last the child burst forth reading the word ! When the child had done that, he discovered all the joy of reading, and he went on reading all the words, no matter how the words were written, whether they were phonetic or not. There was no keeping the child from reading afterwards. The desire for reading grew like the flame which devoured all kinds of words whether written or printed. The only difficulty was to give the child sufficient number of words as he went on reading.

There are different steps in teaching the child to read. First we offer the child objects, the names of which are phonetic — *drum*, *desk*, *band*, *lamp*. We can also offer pictures representing the objects. There are two sets of cards. In one set we find the name of the object behind each picture, and in the other set there are no names behind the picture. In the first set there is a control of error. When the child turns the card over, he finds the name of the objects written.

There are other collections of pictures that consist of objects, the names of which are both non-phonetic and phonetic. The child tries to read the non-phonetic words with the help of his knowledge of the words he already knows. He recognises the non-phonetic words by the occurrence of certain sounds in that word which he knows. That is why we must take the precaution of mixing only a few non-phonetic words with many phonetic ones, ensuring that the child is very familiar with all the objects in the pictures. We must also introduce many words in which two or more letters are pronounced in a particular fashion — the double *o* in words such as *cool, stool.* This offers the child a new field of exploration. He becomes interested in the pronunciation and begins to look for all the words which possess this combination.

The preparation of art work for the child is not easy for the teacher because everything must be beautiful, elegant and natural. There are two sets of cards. In the first set there are only pictures. In the second set each picture has the name of the object written beneath. In the third set, each picture of the first set has a corresponding slip with the name of the object written. At first, the collection of pictures without names is offered. The child does not know how to read, so it is useless to give him the pictures with the names written underneath. Then the same pictures are offered to an older child, with their names written underneath. The child is already familiar with these names, so although they are non-phonetic, he will be interested in reading them. Then the child reads the small cards on which the names of the pictures of the first set are written, and matches them with the pictures. These collections of pictures are grouped together into different sets according to the different items of study that they represent — botany, geography and so on. They serve both as words to increase the vocabulary and at the same time, prepare the child for related studies. The picture collections of the first set of cards are placed in envelopes of different colours. When the child knows how to read, this set is taken away and the second set of cards in which the names are written underneath is put inside these envelopes. Then we put the pictures without the names written on them, and the names written on a separate set of small cards into these envelopes, and the child pairs the names and the pictures.

This is the first step. We merely give the words and objects, and the ground has been prepared for the child to read. This enables the child to learn non-phonetic words with interest and without difficulty. If no such preparation is made, it is not so easy for the child to learn to read. This forms part of what we call static reading, because it is merely a recognition of the words that belong to certain objects and the placing of the cards containing these words corresponding to the objects. This is the first step in reading. There is just one word and just one object.

This presentation is given, not to a group of children, but individually, to help the child to grow mentally. We prepare this special environment to help his growth, to offer him freedom so that he can proceed with his work in a normal way. The collective lessons are given only to the child who has not yet been normalised. After normalisation, each child grows individually, in his own way. One child may be ready for the lesson one day and another child another day. If during an individual presentation, the other children come round and watch, we need not ask them to go away. No harm is done if they come together spontaneously in a group. We must not interfere with the child whether he works individually or collectively. If we give a lesson we do not command all the children to stop what they are doing in order to listen. Many children may have absolutely no interest in the lesson and we may bore them. Usually the reading lesson is given to one child individually. A child who is interested in these words may go on with the lesson for an hour. If we see that he is interested, we can give more new words. In one morning a child may learn twenty new words. On the following day the same child may want another lesson. If he sees the teacher busy with another child, he may call another child, and start teaching the other child all the new names that he had learnt the previous day. So we may sometimes see groups of children sitting together doing the same lesson by themselves. This then is auto-education.

The importance of transmitting ideas when one is not in a position to speak has always been felt. In order to express ourselves in any way, first of all, there must be an accord between the person who is expressing and the person who is listening. Therefore people must agree as to the meaning of whatever sounds or signs they use. So the accord, the agreement, must precede understanding. In olden days there was a time when the people did not write and they expressed their thoughts by means of pictures. This kind of writing is called pictography[1], because it made use of pictures. The pictures were merely diagrammatic symbols. In prehistoric times, all the Native Americans in North America used this same written language although they spoke many different languages. Some people of one village went to visit the people in another village. They did not find anyoneat home, but a note had been left for visitors.

1. Pictography, the forerunner of true writing, was the communication of simple, concrete ideas by means of pictures. It was characterised by the omission of all non-essential details. It was used extensively by the Native American tribes of North America.

The first picture, a symbolic figure of a man, said — " We have gone away." The second picture of a man with outstretched fingers said — " We are many." The third picture said — " We shall be away several nights." The last picture showing the five fingers of a hand and the other hand pointing, said — " We shall be back after five days." To understand this, certainly everyone should have reached an agreement as to the meaning of these pictures in order to be able to interpret them. We caneasily imagine a whole language made in this fashion.

Indeed, many children create a language almost similar to this. Two or three children form a group, and develop a secret writing unknown to their mothers, fathers and teachers, to use only among themselves. It is something which is really quite childish ! So why not then offer such a study to the child? Indeed, the beginnings of all studies are worthy of being offered to the child for they appeal to his intelligence.

From pictography, humanity passed onwards[1]. In pictography, the name of a great Mexican king *Itzcoatl*, is represented by a sketch of the king as he really appeared. Over his head there is a drawing which gives us his name. The names of people often have another meaning. For instance, Brown is a proper noun and also the name of a colour, brown. Similarly *Itz* means a snake and *coatl* means obsidian knife. A ceratin agreement had been reached that a particular shape was the representation of a snake and that the teeth-like things of the comb sticking out from the snake in the figure represented the knife. Thus the name of the king was represented in the symbols. The king had been honoured and his name had been transmitted to posterity through the picture!

1. In *ideography*, the second stage of true writing, the definite pictures were closely identified by custom or agreement with the ideas associated with the object or its action. The symbol depicting *star* could mean *sky, high, god* or *heaven*.

The hieroglyphics[1] of Egypt, are similar. We must understand how human beings have arrived at this simple, primitive idea still used today. Instead of using a picture of the objects as symbols, pictures of things, that when pronounced reproduced the sound of the name of the objects, were used. The symbols represented objects which when pronounced made the special sounds that needed to be represented. So on one side is the obsidian knife — *itz*. However here the snake disappeared. Instead two signs were put in its place — a vase and a symbol to represent water. In the Mexican language the vase was *co* and water was called *atl*. So instead of *coatl*, which means a snake, we have two symbolic representations of the vase and the water. We have thus the samename represented in two different ways — the pictographic way, and the hieroglyphic way.

This kind of representation with many complications forms the basis of certain games often played in our country called Guessing Games. They give pleasure to the mind, and are used to entertain. So we can gather and look for some of these Guessing Games which belong to the prehistoric periods, and give to the child amusement and culture.

We can well imagine how this kind of representation became more and more complicated, and how difficult it

---

1. *Hieroglyphic writing*, a term often incorrectly used to blanket all forms of pictorial writing, refers to the Egyptian pictorial symbols, and is one of the earliest known writing systems. It became highly developed to meet the needs of an increasingly complex society to identify and remember objects and people. Gradually the significance of the picture was transferred from the object to its name. The symbols thus came to signify words rather than objects. Writing became phoneticised and was gradually able to express syntax and grammar. When a bilingual text in Greek and Egyptian dating from 196 BC called the *Rosetta Stone* was deciphered by Jean Francois Champollion in 1822, it was understood for the first time that the hieroglyphic mode of writing was a complex system which was at once ideographic, figurative, symbolic and phonetic.

was to express thoughts in writing in those days. It is these forms of representation in language that have been complicated, twisted, mixed up and used in the more evolved forms of languages. How simple it is now with our evolved alphabets! We take a simple drawing which is very easy to reproduce, to represent the sounds of the language. With the alphabet we can compose any number of words. The alphabet allows an analysis of these words, from which all the beautiful exercises we have already discussed are born. The child becomes enthusiastic, and deeply appreciative of the language that he already possesses.

The child is interested in ideas from prehistoric times, some graphic representations of human thought. They illustrate to him how much humanity has striven to improve writing before arriving at the relative perfection which it enjoys today. In ancient writing, we see the proof of the fatigue, of the effort of people who arrived at a solution which is of service to the whole of humanity.

The alphabet is indispensable when we wish to transmit to our children the greatness of our country, the traditions of the past, and the high and lofty things that inspire knowledge. Through the alphabet we can give the child all the things that have brought us to the height of progress that we have achieved today. We must seek to keep the child's enthusiasm and interest alive. When he reads with the help of the alphabet he may say—"It is my good fortune that I have been born in these days when it is such a simple matter to reproduce ideas!" We can write a book for children about the history of language and illustrate, in a simple way, the pains humanity has taken in making the alphabet, which rendered what was before reserved only for the very learned, or the high priests of culture, available to all. This may awaken in the child, admiration for the marvel of the alphabet and the writing of the present time, and a deep appreciation of what we have, and awaken his gratitude.

In modern times, the teaching of grammar, has raised a great many questions. Modern pedagogy, advocates the freedom of the child and the lessening of his fatigue. In this context grammar has been considered one of the most difficult subjects of study, and educationists have advocated its removal from the curriculum. This is not a solution. We cannot abolish every kind of study, because we continue to teach every subject in a boring fashion.

Now, we might say that grammar is of no use at all! After all it is merely an analysis of language which already exists. It is from the written language, from the study of well-written books that grammar has been made. Therefore, for writing well, it is not necessary to know grammar. The greatest classical writers of Italy did not know grammar. Their works have been held up as great examples, yet Italian grammar did not exist when they were alive! So we must consider grammar as a means by which we can aid the mental development of the child.

In traditional schools, grammar is taught at a relatively advanced age of seven years. Going by our experience of the child, we took it back to smaller children. In fact the study of grammar in our schools is begun with the study of writing, and the study of analysis is begun before the child knows how to read. It is possible to make an abstraction in language, such as that of colour. It is also possible to isolate the abstraction from the other qualities of the object. The study of grammar thus becomes easy.

Each object in the world has a name which is represented by a word. This is common to all objects. All these objects that have names are substantial. The child knows that these objects have names. The objects remain there, along with the cards on which their names are written. In order to extract this abstract idea of the noun, we use a symbol. Here we have something which is neither writing, nor pictography nor hieroglyphy. We represent an abstract idea, with a symbol. The child has been working with the geometrical figures. The equilateral triangle, the most stable figure of all, is used to represent the noun. It is black in colour, something which remains solid, fixed and immovable.

Some words represent continuous activity. We can perform these actions — *walk*, *jump*, *sing*[1]. Of these actions nothing is left when the action is over. Only the names are left written on the cards. No object is left. Here we have the fundamental difference between the verb and the noun which the children grasp immediately. Sometimes we even hear the child saying — " In my house there are a great many nouns ! " Another child may say — " Oh, my mother is always doing verbs ! " The verb is represented by a red circle in the shape of the sun. The red circle is round and always rolls. It is not stable. It denotes by its form and colour — activity, vigour and life.

The first contrasting geometrical figures we presented to the child were the polygon with the least number of sides — the triangle, and the polygon with the most number of sides — the circle. Here we use again that same principle. The contrasting symbols serve to fix, and to render stable, the idea.

There is also another part of speech which is always joined to the noun — the adjective. It may form so much a part of the noun that the noun may become modified. Thus an idea which before was given by both the noun and the adjective may be given by this modified name alone. For instance the word *booklet* means *little book*. Instead of the adjective *little* going with the noun *book*, they are combined into a new name *booklet*. So adjectives, the words that are added to the noun to complete the meaning,

---

1. At this point, students were invited to come forward, read a card on which the action was written and do the action. Today this material is called *Action Cards*.

are represented by a symbol slightly different in size and colour, but the same form, as the symbol for noun. If we consider the language, we see that the noun is always accompanied by the article. The symbol representing the article is very small. The one representing the adjective is slightly bigger. We may compare this to a representation of the mother who holds one child in her arms and leads another child by the hand. These three parts of speech form one group. They form one of the families of words. The parts in the group are closely related to each other.

We may ask a child to *walk*. Next we may ask him to walk *quickly*. In both cases he walks, and nothing remains of the action after he has finished walking. In the second case the action has been modified. So the adverb is like the moon next to the verb, a small circle, orange in colour. The little black triangle[1] which seems to jump towards the red circle is the pronoun. It appears like a little comet, a strange part of the noun family which has been attracted by the verb from which it cannot be detached. This group forms another family of words.

The green symbol represents a chain with three links joined together[2]. When we say — *the vase and the box* — the word *and* is the link which joins *the box* to *the vase*. This is the conjunction. If we say — *the vase on the box* — the word *on* shows the relative position of *the vase* and *the box*. The arrow mark[3] represents the preposition. Then there is a third symbol, a little cloud[4], from which lightning and thunder may come forth, to represent words with no idea at all — the interjection. It only serves to emphasise or accentuate the meaning.

---

1. Today the symbol for the pronoun is a purple isosceles triangle.

2. Today the symbol of the conjunction is a pink hyphen.

3. Today the symbol for the preposition is a green crescent.

4. Today the symbol for the interjection is in the shape of an upside down keyhole in gold.

So the words which move and put the things together, or set them apart, or in a certain position in relation to another, are called the secondary parts of speech. They are to be distinguished from the fundamental parts of speech. The interjection has no importance, but it is placed with these secondary parts of speech. Here we have all the symbols of grammar — two fundamental groups, the Family of the Triangles and the Family of Circles, each divided into three parts, and also three secondary parts of speech[1].

We can pick out verbs and nouns, either in thought or in writing. A great number of exercises arise from this, even exercises to be done by a very small child. Once he knows the symbols, the child will begin to look for the words — the nouns, the verbs and all the other different parts of speech. Little by little, an analysis comes forth, in the earliest stages of writing and reading, through a symbolical representation of the words.

---

1. In the first century BC the Greek scholar Dionysius Thrax isolated the fundamental categories that are generally believed to be found in all languages. These categories, called parts of speech, are basic tools used in understanding grammar and syntax. The list devised by Dionysius has since been extended and modified in various ways.

A *noun* is a word designating a person, place, entity or quality. They are typically heads of phrases that function as augments of the predicate. Thus noun phrases are typically subjects or objects.

A *pronoun* is a word which stands for a noun, or a whole noun phrase, to avoid repitition.

A *verb* is a word that describes an action or a state of being. Verbs are the heads of the verb phrases that may include noun phrases as objects or complements that fill out the meaning of the verb.

An *adjective* is a word that modifies a noun. The adjective is the head of the adjective phrase, which usually specifies in greater detail the meaning of the head noun.

An *adverb* is a word that modifies all words except the noun. Most commonly it modifies a verb. Adverbs serve as heads of adverbial phrases.

A *preposition* is used to form a prepositional phrase that functions as an adjective or an adverb. The name indicates that the word is positioned in English, before the noun phrase.

A *conjunction* is a connecting word which marks equal phrases.

An *interjection* does not fit in structurally with the rest of the sentence.

CHAPTER 28

When the child has grasped the idea that certain combinations of letters correspond to certain combinations of sounds, and that if those sounds are repeated rapidly enough they form a word, he becomes hungry for words. In fact, he becomes so greedy for reading matter that often his parents complain that they can no longer go for a walk with him without stopping at every turn, every shop-window, every place where there is something written, in order to spell and read what is written there. This hunger appears between the age of five and five and a half. During this sensitive period, the child reads regardless of any obstacles, trying to overcome the difficulties of the language, grasping even capital letters on painted signboards with intense interest. It is at this time that we must lay the basis for language study and offer the child an indirect subconscious psychological knowledge of everything that is to follow later.

We have also to remember that in language, we do not have to teach the child anything, because he already possesses the language when he comes to school. He knows the nouns. He knows the difference between the singular and the plural. He knows all the accidents in the language. There is nothing new that we can teach him. However, in order to help the child understand the language better, the teacher has to do a great deal of work before going to school. Most of our work is not in the school but out of it, to prepare the materials for the lessons. We cannot go in and blabber to the children. This is of no use at all. Instead we must prepare the material in such a fashion that the points we want to illustrate, stand out clearly.

When he reads, we can help him to understand the difference between the singular and the plural. We have cards on which the words *cup* and *cups* are written and we also have many cups (objects) on the table. To show the relation between the written words and the object which they represent, he will take any one of the cups and place the written word *cup* near it. Then he will take the written word *cups* and place more than one cup beside the card. In this way the function of number (the singular and plural) is made clear to the child by the fact that in one case he took one object and in the other he took more than one.

We can also help the child understand the functions of the definite and indefinite article[1]. We have several chairs and only one knife. When we say *the* knife, we refer to that particular knife. So we determine the special object and distinguish it from the others. When we say *a* chair and there are many chairs, we refer to any one of those chairs. We also have cards on which the articles and the names of the objects are written. The child reads and places the cards appropriately together. We can also prepare the plurals — *the knives*. So among many objects such as chairs, jugs and tables there are two knives and the child finds the knives. For this too, there are appropriate cards.

The noun always remains the same, and the adjective which is also of the same family goes with it. So in order to illustrate the function of the adjective, we can have a group of cups, of different sizes and colours. We offer the child slips with the appropriate adjectives. If the child reads the words *little* cup, the large cups and the medium-sized cups

---

1. In the original manuscript, Dr. Montessori notes here that in English the article does not change with the number or gender of the noun, as in Italian. She also notes that while introducing the article in Italian the children reveal pleasure and interest in each change of the article.

are eliminated, thus restricting the choice to only three cups, which are small. With the word *little*, we have made a distinction among the cups. Then we offer the child another slip of paper on which another adjective, *opaque* is written. So the *transparent* cup is also eliminated, leaving only the cups that are *little* and *opaque*. Then we add the word *brown*. Thus we have from a number of cups arrived at one special cup which is *little*, *brown* and *opaque*. These words used to eliminate a number of cups until the one we want is distinguished, are called adjectives.

We can offer the child another exercise to illustrate the function of the adjective. There are many kinds of triangles[1] of different sizes and different angles. In order to specify each triangle we have to use some adjectives. We offer the child a slip of paper with the words *rectilinear triangle*. All the curvilinear triangles disappear. Next, we give him a slip with the words *isoceles triangle*, so that all the triangles that are not isosceles are eliminated. Then we ask for a *white triangle* and all the coloured tirangles are eliminated. Finally we ask for the *little triangle*, and from all the different triangles, the child picks out the only one — the *little*, *white*, *rectilinear*, *isoceles* triangle. We must remember however, that this is not a study of grammar, but only an exercise in reading — interpretive passive reading. We can see if the child is capable of understanding the meaning of the words he reads. The more adjectives we add, the more complicated and the more interesting the game becomes. It is curiously easy to interest the child in words, and the meaning of the words penetrate into his mind. We offer him the physiology of the word, the function of each word, and he soaks the knowledge in, without ever knowing that he is learning.

---

1. Today, this activity is called the Detective Adjective Game. However, along with triangles according to their size, colour and sides we also use triangles according to their angles. We do not use curvilinear triangles.

These kinds of exercises can be repeated with many objects. For instance, in the case of adjectives, while the number of words that accompany the noun increase, the noun itself remains the same. There is only one object. The possibility of determining the special object that we want becomes more and more easy, and the description of the object becomes more and more perfect, by using more and more adjectives. but the object itself always remains the same.

In the beginning we give the child only the substantive nouns, those that represent solid, concrete objects. The child is made to understand that we want to determine those words in the sentence which indicate the objects by the sign which represents the family. So in the later period when the chid is given a sentence for analysis, he tries to find the different words that are substantive nouns. We do not offer any definition of nouns at first, we just ask the child to see those words that represent the objects, and place a symbol above each one, to represent the noun, and thus indicate the family to which the word belongs. The analysis of sentences is therefore the method of separating or classifying those words that have certain functions in common, and distinguishing them from the rest by a name.

Many of the children we have to deal with have passed the sensitive period for reading with no preparation. These children, present a certain problem, but it is not as insurmountable as we sometimes think. The secret of our method is always the same — to keep in mind the sensitive periods while offering activities to the child. If the child is between six and a half and seven and a half years of age, his interest will be in the physiology of things, in the reason behind things and not in the function of things. Therefore we must do experiments in natural science in the laboratory, or introduce to him the function of words, thus appealing to his interest. Interest is the life of the intelligence. If we kill the interest and enthusiasm we cannot do anything. We must keep the child's interest alive by choosing exercises that appeal to him according to his age, and his intelligence. In the decimal system for instance, we offer the child the whole functioning of the decimal system, and allow him to grow mentally according to the interest that he takes. In the same way, we offer the child who is ready to read, the exercises that are of interest to him at his age. His enthusiasm will not stop there. He will get a great deal of information from the books he reads. The children who do not know how to read, will then go to children who know, and ask to be taught. It is thus interest that drives the children who cannot, to learn how to read. Once we have kindled the interest in the child, nothing will stop him from reading. He will be ready for any amount of study, no matter how difficult or long. Once he learns to recognise the form of the letter, even the child who has passed the sensitive period, who had got the interest from other children, becomes interested and learns to read. This is a curious fact. We must therefore give the child the incentive to read. Once the interest of the child is kindled, it does not stop at any obstacle.

One day, I visited one of our schools where the children were working with flowers. I wrote on a piece of paper in red, in big bold letters, *red flower*, and placed it on the table. All the children were interested in what had been written in such bold letters. There were also some yellow flowers along with the red ones that the children had. Then I wrote in bold yellow letters, *yellow flower*. At once the children burst out that it must be *yellow flower* and guessed that the other one was *red flower*.

Seeing that the children were interested in the function of words I gave another lesson. I wrote *the red flower and the yellow flower* on the board. From the flowers that the children had, I took two flowers, a yellow and a red and tied them up together. The children saw that and joined the two flowers. There is no better way of illustating the conjunction than by isolating it. The conjunction is always written in a different colour to distinguish it from the two nouns which it joins together. The children were thrilled with the exercise, and went round trying to make more combinations. We can also introduce the different groups of objects in different attractive colours and offer the child the family comprising of the article, the noun and the adjective as phrases written out on slips of paper — *the brown chair, the transparent vase, a golden cup.* The child begins to make combinations of all these different objects with the conjunctions. So objects which were separate before, come together with this word.

Out of the exercise illustrating the function of a conjunction, another exercise evolved. The red and yellow flower tied together in a bunch lay on one side of the table. There was the transparent vase on the other side. The bunch of flowers tied together was put into the vase and on a slip of paper the words — *the red flower and the yellow flower in the transparent vase* were written. The word *in* appeared in a different colour. This too was merely offered as an exercise in reading.

We can further study the function of prepositions by a study of sentences, by seeing the actions carried out with the objects. We can have the objects needed, to lay a table, for a breakfast for two, and also a variety of slips, in which the prepositions are written in a different colour. The children can carry out the sentence game. On one slip are the words— *Put the lid on the coffee pot.* On another we find — *Put the brown chair near the table.* Another slip reads — *Place the second brown chair opposite the first brown chair.* When the child has carried out the directions of the sentences, order comes out of chaos by placing the objects in the positions indicated by the prepositions. Finally from the scattered objects, we have a table laid out in order for breakfast for two.

These exercises created a great deal of excitement. When the children saw the relative position of the objects, they became so excited that the smaller children of the next class, came in curious to see what was happening. They also became interested in the exercise and asked the older children who knew it to teach it to them.

Very often when we work and shape the material for older children, we find that it appeals to the little children also. A little child used to come and play with the objects in the room in which I was teaching square root to some teachers. An older brother of his used to come to fetch him. He knew already something about the squares, and was interested in what was being said and would listen. The teachers had not understood anything, but the boy said — "I have understood what a^2 and a^3 mean." There are certain periods in life where if the interest is kindled, everything appears clear, when the child becomes very enthusiastic and learns readily. When we are older, the understanding does not come. It takes a long time before the thrill of mathematics is felt by the older ones. Yet if mathematics is offered in that sensitive period, everything about it becomes interesting.

The small children who became interested in the preposition were just five years old. They had just started to read. When they saw the symbols among the words that were written, they became excited. They had just started reading and were in the sensitive period. So the sentence analysis which we thought was going to be very difficult, which we, with our logical minds thought could, not be offered to the child who has just started to read was discovered by the child in the language itself.

While the child's interest in reading grows, his interest in grammar and sentence analysis also marches step by step with it. Just as we individualised the noun with a large back triangle, we individualise all the other parts of speech as well. So along with reading there is an advance in grammatical analysis. We try to abstract the quality of a particular part of speech and fix it in the mind of the child with a symbol.

To feed the child's growing interest in reading, we can offer him explanations or definitions of objects with which he is familiar. First of all the child is presented with the object, or a picture of the object, and given the name. After he has perfect knowledge of the names of all the objects in that collection, he can learn their definitions. The definition is thus the crown of hard work and long term experience. These definitions are offered to the child by means of special booklets. The pictures in the booklet must be attractive, colourful, and constrasting. On the cover page is the title of the booklet which tells us what it is going to deal with — the leaf, or the cow or any other subject. The method of presenting the figures is the same in all the booklets. One colour must be used for all the diagrams in the collection. The picture appears on one page, and the definition appears on the opposite page. It explains what the picture represents. In the writing the capital letters should be painted red or blue and the other letters in the common writing form. A definition is a statement which gives in the smallest number of words and in the clearest way possible a statement of reality, with all the dignity that it deserves.

On the cover page in a booklet there is a picture of a leaf. On the first page is the same picture and some writing — "The leaf has three parts, the blade, the stalk and the stipules."

The second page has a diagram of the isolated lamina, which is coloured brightly leaving the rest of the leaf in outline. The explanation is on the facing page — "The lamina is the broad part of the expanded portion of the leaf." On the next page, facing the isolated petiole is its definition — "The petiole is the lower narrow stalk, which connects the blade of the leaf with the stem or branch." And lastly facing the isolated stipules are the words — "Stipules are the narrow laminery expansions somtimes to be found at the two sides of the stalk where it joins the stem." We must prepare for the child a great many of these booklets, to offer him the beauty of the details and the knowledge of things in his world. The presentation should be attractive enough to encourage the child to go on reading.

Often silly, funny stories or cartoons, in children's books, do not appeal to the child. The kind of books we need for the child are expensive to produce. Publishers will not print such books. If they did, schools would not be able to afford them. So we have to prepare them ourselves, as teachers. There has never been a library for children. We must create such facilities. In traditional schools, as soon as one grade is finished, the books are put away forever. When the examinations are over and vacation comes, there is an end to all learning until the school reopens. Then there are new books. However we cannot destroy or put away forever something that appeals to us, and holds our interest. Therefore we must make many beautiful and attractive booklets to add to the library so that we can present every detail to the child in a very attractive and interesting manner. When we prepare the booklets, we must go from the whole to the details, no matter what the subject — zoology, botany or biology. This is merely reading practice, but the children in our schools know more about things than even the teachers! The child will learn anything that we offer him provided we can keep his interest alive. This is the secret of education.

CHAPTER 29

We say that the child must be active in the school. People often understand this to mean that the child must move about in the school in order to learn. There is however another interpretation of the term active. If we present an item of knowledge to the mind of the child by means of activity, knowledge secretly penetrates into his mind during the course of the action which is being accomplished. He then understands the idea better. Language is one of the greatest inner fields of activity of the child. Grammar, which takes up the language for analysis can be offered in an active form. This is almost like bringing the language to life again. Some philosophical ideas may penetrate better in this manner.

The study of the verb is usually the most difficult part of grammar studies. If we stop to think about it, we can see that the verb is also the most active part of language. So first we offer the child verbs in a demonstrative fashion and show that they indicate action. After the action is carried out, the child sees that there are a great many different actions which result in merriment and happiness. He thus becomes deeply interested in the verb.

In the first exercise done with verbs, we offer each child a card on which an action that has to be carried out is written. Sometimes these cards are distributed to many children who carry out, at the same time, the action on their card — *run, walk, jump, sit.* Sometimes all the cards are given to the same child, who carries out all the actions one after another.

If many actions are carried out at the same time, there is chaotic movement. If one child carries out all the actions one after another, it is like dramatic actions creating a succession of movements. This idea that the verb represents movement, represents activity, must be fixed in the mind of the child by repeated exercises.

After this is established, we go on to another special characteristic of the verb expressed in English as tense. There is a logical succession. The idea of tense comes in only when the idea of movement has been established, because time is always determined by some kind of movement. We measure time by the movement of the earth around the sun. If we use a watch, we measure it by the movement of the hand around the dial. So time is always measured by some regular movement.

When we refer to the tense of the verb we refer to another kind of time which has no absolute, but which is yet an absolute. For instance, when we use tense we use expressions that indicate time. When action takes place in the present there is no measurement of time. The action in the present lasts indefinitely. When the action which is being accomplished, is finished, then the present also is finished. This is clearly seen when the action is carried out upon an external object. Such an action lasts for a shorter time. Let us take a sentence in the present tense — *I drink the water*. When the person carrying out the action of drinking has finished, he must say — *I have drunk the water.* He has already entered the past. The expression itself says that his action is finished and it has entered the past tense. I can say — *I give a lecture*. Then my present would last about an hour and a half. I can say — *I teach a course*. Then my present would last three months[1]. So

1. This course began on November 14, 1939 and ended on January 31, 1940. Refer also to the *Introduction* (Volume I page xii).

the present floats around and has no absolute. It does not refer to a specific time span but lasts as long as the action.

We can carry out an action, and simultaneously say what we are doing. I can say—*I write.* I may also really write. When I have finished I may say — *I drink.* I may not carry out the action while I say the words. Where then is the action? It does not exist. If we speak about an action which happened in the past, there is no physical action. The action and the word are seen together only in that fleeting moment when the person is carrying out an action and talking at the same time. Afterwards there is nothing except absolute immobility. We should therefore say that the verb is a word rather than action. In Latin, *verbum* means word. I can talk of what I did a month ago, or a year ago. I can also talk of what I can do. These are mere words without reality. So the verb is an accumulation of words. There is no action. It is like a fairy tale, a memory, a hope. There is only imagination, no action.

There is only one case in which a verb may be said to represent an action, when the action and the word meet together — in the first person, of the present tense in the indicative mood. All the other tenses in the indicative and subjunctive moods, are but action and thought translated into words. Who is this person who talks? This is the other side of the question. I say—*I write.* It is the first person who talks. I may also say afterwards — *I have written.* Yet I need not do anything. The *I*, whether carrying out the action or not, can talk to just one other person, therefore distinguishing that person from the crowds. This important personage brought into the lime-light, and so honoured by the *I* is the Second Person. He does not talk. He does nothing at all.

To break this monotony we can put into practice the democratic principle, and say — *We talk.* Yet it is only one person talking ! If they each say what they are doing, we would hear many people simultaneously saying — *I talk*. However there is only one speaker who says — *We talk*. He talks in the name of all the persons that form the group — we. So we arrive at the conclusion that the verb is nothing but the *I* who talks. He can talk about himself. He can tell of his past life, his hopes. He can tell of the whole group of persons. We observe, that it is always the *I* who talks and tells and hopes for the others. In the book, there is the author who writes, who tells us of all the events in the book. It is a tale. We certainly never see anybody acting when we read the book! This is the most classical demonstration of the *I* who talks, who tells the tale when we read a book.

All this we might say, is evanescent. We can be evanescent in many ways, in many moods. When a person is in an Assertive Mood, he says with great clarity what he is doing, what he has done in the past, how he has done it, and what he is going to do in the future. He is sure of his ideas. He is sure of his actions. He is sure of himself. This is one mood.

There is another mood in which this kind of security is no longer there. This is a doubtful mood— *If I had a car, I could go to the beach*. Here there is no assertive will, or security, or sureness of aim. We no longer talk about facts, we talk about hopes. There is nothing, not even the personality of the speaker.

Then there is another mood of the person who has an impelling personality, who has become a dictator. This is the imperative mood. I say — *Write it down*. Where has the *I* gone? When I become the dictator, when I start commanding others, I must renounce the *I*. In the verb, lies the psychology of man, because we can never be dictators of ourselves. The imperative mood is only used in the second person. As soon as we become dictators, we lose our personality, and the *I* is finished.

So we see the strange moods. The movements of thougts are more or less the same in all languages, so all languages share these moods. We need to penetrate into the philosophy of the verb to touch upon the things which a child can be made to understand. We can penetrate the mind of the child by carrying out different actions. Through action, everything becomes alive and interesting. When the children talk to each other in their daily conversations everything becomes clear.

Grammarians classify verbs into three groups — Transitive, Intransitive and Reflexive. It is very easy to show this classification in its whole.

If we take out all the pencils from the box, and put them on the table, we are carrying out an action upon the objects, the pencils. When we move something, we carry out an action which passes from the person to an object. The person needs the object in order to carry out the action. There is a subject who acts and an object with which to act. I can say — *I lay the table.* I can do the action for a long time. The action being carried out can be seen. This illustrates the function of the transitive verb. I say — *Walk.* A person can walk without any object to walk with. This is the function of the Intransitive Verb. I can say to a person — *Wash yourself.* We see here there is an object. There is also the subject, the person who washes herself. So the action goes back to the subject, with the aid of an object. This illustrates the function of the reflexive verb.

Verbs are represented by a red circle. When the verb is transitive, we add an arrow to show that this action passes to another object. We say — *He lays the table.* The arrow points to the symbol which is the object — *the table.* We can symbolically represent the subject carrying out an action upon the object. So, this becomes a kind of analysis. This is what we call Logical Analysis or Sentence

Analysis[1]. Everything thus naturally and spontaneously forms a part of the language. Language is a living whole. When we take the subject, who carries out the action upon the object, into consideration, we seek amongst all the other words, those which represent actions. In a page of written matter which we prepare for the children, we must first put a small red circle on top of every verb we find. If there is a word, which shows that an action has been accomplished, there must naturally have been someone who has accomplished it. Who carried out the action? Upon which object has the action been carried out ? These also form interesting items. We can seek the different words and analyse them all. The answers to these questions can be dramatically expressed.

We must now recall the importance of the preparation of the children before they knew how to read, when the little children were given exercises in conversation, while they were seated with the teacher round the table. It was a game of questions which the children had to answer. So, just as we individualised all the nouns in a sentence, we must now, individualise all the verbs in the sentence. We must also seek the one who carried out the action, and find out upon what object it was carried out. We see that there are as many actions as there are verbs. This forms another branch of grammar which branches out into more and more amusing complications.

There is yet another aspect to this exercise — the recognition of the different parts of speech. Just as we place a red circle above the verbs and a black triangle above the nouns, we can place a symbol to represent each part of speech in a sentence. What a revelation this translation of words into symbols, offers the child ! We call this Grammatical Analysis[2].

1. Today we call this activity Reading Analysis.
2. Today we call this function of Words.

CHAPTER 30

The theories of biological evolution are, we might say, modern[1]. The older theories were formed by observing living beings in their adult stage. These observations revealed that adult beings could not change. The mere thought of change, gave rise to certain philosophical theories. The older theories brought in two schools of philosophy which caused humanity to ponder over these things, while the more recent theories based on mutation have brought in something of practical experience. As long as we observe only adults, we merely remain in the field of philosophical theories. However if we turn our attention to the age in which the being is still changeable, when the being is an infant, then practical action is possible.

For our convenience we have divided theorists into two groups. The first group of old theorists have raised philosophical questions, while the second group of theorists have

1. Until the mid-19th century naturalists believed that each species was created spontaneously by a supreme being, or through spontaneous generation by which organisms rose fully developed from soil or water. With advances in biological classification, the modern synthetic theory of evolution combines the findings of genetics with the basic framework supplied by the theory of the origin of the species by natural selection. This creates the basis for population genetics by which variability among individuals in a population of sexually reproducing organisms is produced by mutation and genetic recombination. The resulting genetic variability is subject to natural selection in the environment.

put forth theories which give practical results, and opened an infinite field for research work. The theorists of the first group, who carried out their work on adults were — Lamarck[1], Darwin[2] and Lyell[3]. The second group, practical theorists who carried out studies upon the mutations of young beings, has only one name — de Vries[4].

Research carried out by Lamarck and Darwin on the different species of beings showed that there are some beings which are simple, and others that are more complicated, in their organisation. It is evident that the more complex beings, have evolved from the simple ones. Before these theories were propounded people believed that God had created all creatures in a certain way, and that was the end of it. This is the easiest solution to the problem. God does create everything. Yet there is something to be

---

1. Jean Baptiste Lamarck (1744–1829) a Frenchman, and the originator of the term biology, proposed an erroneous evolutionary theory that organisms acquire new characteristics in response to environmental factors, and pass along these traits to succeeding generations.

2. Charles Robert Darwin (1809–1882) a British naturalist is well known for his controversial theory of the origin of the species through natural selection presented in 1858. The theory he proposed, which had far-reaching implications, was that all living species developed from pre-existing forms, that all things in nature change with time, that variations among individuals in a species make their bearers better adapted to particular ecological conditions.

3. Sir Charles Lyell (1797–1875) a Scottish geologist explained geological phenomena in terms of currently observed natural processes operating over large periods of time. His work *The Principles of Geology* was responsible for the general acceptance of the view that all the features of the earth's surface are produced by physical, chemical and biological processes through long periods of geological time. His extensive travel in different parts of the world when rocks were first being described helped him arrive at a unified view of earth history.

4. Hugo de Vries (1848–1935) was a Dutch botanist. He carried out research into the nature of mutation in plant-breeding. His conclusions paralled those of Gregor Mendel, who unknown to de Vries, discovered the basic principles of inheritance in 1865.

said for looking to see how everything is created by God! The first study which was carried out, was to see how from the simpler species the more complex ones evolved.

To examine something closely, we must look at the complete being, the more complex form of life. Therefore, the fully developed, readily evident adult being was studied. Those in the course of development were not even thought of. Lamarck believed that the greatest strength that there is in life is to become adapted to the environment. So any change takes place gradually. If anything happens in the environment, little by little with successive generations, new organs which allow these beings to live better in the changed environment are also evolved. This very slow effort, inherited over thousands of years, with each generation carrying out an invisible change so small that its traces cannot be found even if followed over a hundred years, shows the enormous length of time that it takes for the species to change.

In order to go to a different environment, the beings create the organs necessary to be able to live in that environment. Hence Lamarck said — " The function creates the organ." We can describe how amphibians came into existence according to this theory. There was once a being which lived in the water near some land. It produced its young ones by laying eggs in the water. This being felt a great attraction for the land, but knew if it left the water, it would die. In the great longing that it felt for the land, it developed a little beginning of a lung, and it transmitted this growth by heredity to its progeny. Its progeny further developed its lung by heredity, and so from generation to generation the lung progressed until the creature was able to live on land. For a new function, to be able to live in a new environment, it created the organ. We can also tell the story of the reptiles that became birds. Long ago a reptile began to think — " I want to uplift myself. I want to go higher." By the same process of desire and heredity, the creature developed wings. Indeed, traces have been found of the great flying reptile[1] which functioned not like a bird, but somewhat like the flying mammal of today — the bat.

There may however be a function without the organ. If this is so, how could the function make the organ? Today, experience and facts show that it is the function which creates the organ. The theory remains the same, but the interpretation is different. Today theorists say that it is the environment which calls forth this transformation on the part of the being. When the environment calls forth this change, there are certain periods in which the possibility of change are more accentuated, resulting finally in a complete change. The environment needs the new being. The beings do not all of a sudden say — "I am tired of my life as it is. I want to change." Whichever theory we accept, it is all at the level of philosophising and theorising. If we think about these questions for a long time we realise that it is like seeking to find out which came first, the egg or the hen. We can go on thinking about it without ever coming to a conclusion. So the scientific world put aside Lamarck and his theories.

Darwin's well-known theory of the struggle for existence, that bears the mark of genius, has brought him fame in the scentific world. Every being has got to fight for its existence if life is to go on. In this race for survival those who survive are always best suited to that environment.

---

1. The record of bird evolution is sparse. The topic is the centre of heated debate. Many paleontologists believe that birds evolved from some small bi-pedal dinosaur during the Jurassic period. All modern birds are thus descended from a flying ancestor, the long extinct *pterodactyl,* a reptile. *Archaeopteryx*, the oldest known bird, lived 130 million years ago. It had teeth, clawed wings and traces of feathers. It was the evolutionary link between birds and their reptilian ancestors.

The fittest does not mean the strongest, but the being fit for the environment at that time. This theory had a wide appeal in those days, because it corresponded to a certain reality in human social life. However real it seems, it is certainly against our moral code to say that progress can only come through killing and fighting. Yet this was the idea of Darwin.

The third of the theorists, Lyell, was not a biologist but a geologist. Lyell showed the succession, the changes of the species. He showed that first came certain beings and based on the scale of the changes which evolved, were derived other beings, one from the other.

These theories may be linked together — one says that the species change by effort, the need for a function causes the change of organ, another one says that the species changes by effort and the survival of the fittest, and yet another says that later beings evolved from earlier ones. For us the most interesting conclusion is that all these changes require the effort of adult beings. To adapt to an environment an immense effort is necessary to develop the necessary organ. In the struggle for existence an enormous amount of effort and will has to be spent in order to fight.

Then, why and how is it that infants, beings in the course of development, who have not yet developed the organs, who are not capable of fighting, also survive? If we consider insects, we see that young beings undergo a great many changes called metamorphoses and that each change brings a new characteristic.

If fighting, effort, struggle for existence, strength and the possibility of adaptation are the characteristics of the adult being, how is it possible that the adult exists? Each adult being has passed a great part of its life in which it did none of these! Each being is born an infant. It had to be born an infant. In order to become an adult, the being must grow. While an infant it could not do any of these things!

This called the attention of the scientists to the beings which were in the course of development. They had to discover how the young, who were incapable of fighting and defending themselves worked in order to develop. This was one branch of the research that was carried out. Another branch of the research was to see if it was possible for the young ones to inherit some of the changes brought about by effort in the adult being. For instance, studies were carried out on working men, who on account of manual labour had developed callouses on the palms of their hands. Though from generation to generation the men in their family had been doing the same kind of manual work, it was discovered that none of the children who were born to them had any callouses at birth. They had smooth hands, as any other children. So the unanimous conclusion arrived at everywhere was that the changes which occurred by adaptation in adults were not automatically transmitted to the new generation. So there were two trends of investigation — the one about heredity, of the acquired characteristics of the adult being inherited by the young of the adult, and the other about seeing how these young ones survived when they did not possess the means of fighting or the means of adaptation. None of these theories truly explain the survival of these energies to adapt, to fight and to change.

Fabre[1], whose books have been adapted in many parts of the world for children, calls upon the marvels of life in the course of development. He discovered that there was a certain force which protected these new born beings and that this

---

1. Jean Henri Fabre (1823–1915) a French entomologist, was an associate of Louis Pasteur and an opponent of evolutionary theory. Fabre wrote some of the most fascinating books on insects ever produced. They are filled with acute observations on the life and death of the creatures and are of deep interest to the layman. They have been translated into all modern languages. Among his works are *Life and Love of the Insect* (1911) and *Social Life in the Insect World* (1912).

energy was expended on the part of the adult towards the new generation. Fabre calls this the spirit of maternity which compels or urges the adult to prepare for their young ones an environment suitable to their lives. For instance, the birds that build nests reveal neither a struggle for existence nor adaptation to a new environment. In studying birds and other animls, it seems that the ferocious instincts in certain animals disappear for a certain time during parenthood. This interruption, the instinct which directs the preservation of the life of the individual, replaces as it were another energy which directs the defence of the species.

There is also another fact to take into consideration — the strange instinct, the strange energy, which seems to render the adult capable of finding that environment which offers the conditions of life that are most suited to the young being that will come forth. For instance, the spider who usually makes enormous webs to catch the victims with threads that are almost invisible, all of a sudden builds a nest which has a double wall, which is stronger than the cocoon of the silk-worm! It is this intelligence which guides the adult being during parenthood which compels a being to develop a new organ for its existence.

Does an adult being become intelligent because of the experience that it has? There are certain butterflies which die as soon they have deposited their eggs. The butterfly could know nothing about its eggs before it lays them. Its only prior experience or knowledge could be of flowers and honey. Yet it chooses among all the plants it visits, a particular plant with leaves of a special age, neither too young nor too old, which would outlive the eggs that are laid on it. It lays the eggs on the underside of the leaf so that they may be protected from the sun and the rain, and from the sight of birds that may eat them up. This butterfly, which cares for its eggs in such a wonderful way, has never before had this experience, nor will it have such an experience in the future. It will die as soon as it has laid the eggs. So this intelligence of the parent is informed by the spirit of love, an energy which is in the adult to protect those who have no means of self-protection. This is one of the greatest agencies in the survival of the species.

There are two sides[1] to the life of an adult being — one directed at his own defence, the survival of the individual, and the other directed towards the survival of its young.

Practical experiences and laboratory experiments, have shown that during certain periods of growth, beings that are in the course of development are capable of changing, and of acquiring certain special organs suited to the new environment. When these periods have passed, the sensitivity which makes them capable of acquiring special capacities in these periods also disappears. At the time when de Vries, was making these studies on plant life, I had discovered that there are certain periods in the life of the human child, during which he could accomplish great things, and that this possibility disappears with that age. When de Vries came to one of our schools in Holland he said — " You have discovered the sensitive periods[2] in human beings! "

From one of the plants on which de Vries was carrying out his experiments in his laboratory, came many plants, each of which was of a different species from the original plant ! This plant spontaneously produced mutations in its young ones. This discovery caused a great commotion and all the other biologists of the time began to study and observe this fact. Through further studies, it was discovered that it was possible to provoke mutations, but the

1. In the original manuscript, Dr. Montessori duly notes here that if she had had a longer course she would have dealt with the two lives of each being — as an adult and as a child. She also reiterates her stand that no human problem can be solved if only adults are considered.

2. In the original manuscript, Dr. Montessori acknowledges her debt to Hugo de Vries for her use of the term *sensitive periods*, so well known in Montessori studies today.

experiments of such mutations were carried out upon the germs[1], only at the very origin of the embryonic stage, and not on the adult plants.

These mutations have reached such a degree of perfection, that now a patent has been taken out in America[2] for the mutations produced on bees. When the eggs of bees were exposed to certain rays, a different kind of bee with no sting was produced which could be handled without threat. These bees yielded a greater amount of honey of even better quality. So this study brought about a practical result. It is not confined merely to the realm of philosophical discussion. The important fact is that these new bees witout the sting produced bees similar to themselves, without any further need of action of the rays on the eggs. So the discovery was made that these mutations can become hereditary, and can be transmitted from generation to generation if the action is carried out just once upon the young forms of life.

Biology thus furnishes the most valuable proof of the importance of the life of the young in the survival of the species. When the conditions are favourable, transformations, changes and new species, can be produced through external agencies being brought to act upon them. This and the energy of love in the adult and in the young being, explain the survival of the species.

We must open our eyes to the importance of the life of the young. Social problems will never be solved while they are looked at only from the point of view of the adult. Solutions to these problems can be found, by taking into consideration, the possibilities that childhood offers. Per-

---

1. A *germ* is that portion of an organic being which is capable of development into the likeness of that from which it sprang. It is therefore a rudiment of a new organism.

2. The word used in the original manuscript is copyright. See page 32, Volume I.

haps a day will come when society will feel the need to offer special conditions of life to children, so that the next generation will not have to deal with the problems with which we are faced today.

CHAPTER 31

There was a mother who was persuaded always to tell her child the truth. The child asked the mother — " Who forms children ? " She replied — " It is the mother who forms the child." Two years later, the child said — " You always say that it is the mother who does everything for the child, but I have never seen the mother doing anything with her hands ! "

We have the same difficulty in understanding the great and mysterious fact of evolution. We reason somewhat in the same manner as the child reasoned! What we can understand are the phenomena that can and must be observed, and that which is revealed to us by facts. Until some of these facts are brought to us by experiments so that we may observe them, we remain in the field of imagination. That is why all facts are of great value. It is also why the study of the earth on the whole is of great impotance.

We touched upon the evolution of the animals in the sea When more land emerged from the water, the rain washed more calcium carbonate into the ocean. There arose the need for more machines to eliminate the extra calcium carbonate. Thus there followed a period of great variety. This is evolution — this multiplication of different species of animals. However this multiplication of species (whose growth was arrested later) is not explained by the individual urge towards evolution. It is not the urge of the species or of the animals themselves, it can only be explained by the need to keep a vital equilibrium. There was a great need to keep the water pure, so a great many beings were needed to absorb the calcium carbonate dissolved in the water in order to maintain the equilibrium. It is true that the animals have in themselves the possibility of transforming themselves. This urge does not come from within the animals, but from the needs of the environment.

Now, in studying the evolution of life upon land we find it logical that vegetable life, something which grows by itself so that the animals can live upon it, came first, in the enormously long period of the Carboniferous epoch. In this epoch, the kingdom of insect life also emerged. At the end of this epoch, enormous frogs and toads appeared. Very, very small reptiles also began to appear. In the next epoch, the reptiles developed to great sizes. They multiplied, and in their turn became the emperors of the land. Of course these beings survived the same length of time as the others. They in their turn, after growing to exaggerated sizes, disappeared. What is left is minute compared to these great specimens! Towards the end of this epoch new forms of life appeared, representing birds and mammals[1].

In relation to the changes in the fauna, there were also changes at the same time in the land itself, due to cataclysmic changes of apocalyptical importance. When big earth quakes occurred (or perhaps even without earthquakes) the land sank below the level of the water, and the waters invaded the space which had been occupied by the land. When the earth stopped sinking further, big shallow lakes

1. The earliest reptiles were seen in the Triassic period. They varied greatly in character. Some resembled lizards. The dinosaurs walked on their hind legs. Through the Jurassic period they developed in size, becoming heavy and unwieldy. Some dinosaurs had feet nearly two feet long! Birds began to develop. During the Cretaceous period, dinosaurs disappeared. Their disappearance has not been fully explained by scientists even today. The earliest mammals were seen in the Cretaceous period.

of enormous sizes (so big as to extend over the whole of Europe or Russia) were formed. These lakes became filled up with the earth brought down from the mountains. Once again, life appeared upon land, and plants invaded the whole space.

Then another cataclysmic event occurred, and once more the land sank. The trees that were standing upon the land sank as well, but remained erect. These trees rotted and decayed in the water. Humid environments need some agent to destroy plant life by the external multiplication of insect life. There were many insects, but those who really triumphed, who were kings of the realm, were the white ants. The penetrated the rotten wood and ate it, until the trees became hollow, or until no trace was left.

The conditions of life for the appearance of animal life, and the other forms of life are co-related. When the water receded and the land dried up again, all the water did not flow into the ocean, because new mountains intercepted it. This water dried up, and deposited enormous quantities of salts in the land. This land which was once covered with water, became a desert, and reptiles began to live there.

So changes occur — there is evolution. With every change, there is a change in the form of life which corresponds to the need created by that change. The facts which have been observed during the study of biology, reveal that the emergence of animal life on land, as in the case of life in the sea, correspond to the needs of the environment. Thus evolution is called forth, by the needs of the changing environment. If we look at evolution from this point of view — that the changed conditions of the environment call upon the animals to fulfil this new function, to transform themselves and form new organs — we can say that the function creates the organ, and urges the species to change. This circumstantial evidence, reflects the idea that in the creation of the land, the creation of life takes place, and in this creation it fulfils special functions.

Today another concept is explained by the theory of mutations. A certain moment may arise (and it does arise) in which the species has a tendency to transform itself — as the species passes through a sensitive period for mutations. Each species has a period of infancy, a period of development, a period of maturity, and a period of decadence. Finally the species disappears. Land animals adapt to the changed conditions of the land. It is because the environment has changed that this adaptation occurs. So the animal transforms itself during the sensitive period of the species. Once the species reaches maturity, its characteristics are fixed. Experiments with the action of certain rays upon germs have created new species of germs. Some of the changes brought about by the rays are hereditary, while some are not. Those that are hereditary, are fixed changes. They are characteristics of a new species.

This recalls the theory of Darwin who said that the being most adapted to the environment is the one which fixes its characteristics. However these first intuitions are proved by new facts. For instance, if we look upon the different races of human beings, we realise that the race passed through a sensitive period when as a defence against climatic conditions certain dark pigmentations came forth. The people in places where the sun was strong developed dark skin, different from those who lived where there was little sun. When the sensitive period had passed, these characteristics and pigmentations remained fixed, so no matter what the climatic conditions were afterwards, the pigmentations remained unchanged. The new theory is that the transformations and mutations come not from an urge of the individual but through a sensitive period of the species.

There are also other interesting periods in evolution that prove, the existence of sensitive periods. The child, greatly attracted by the environment, in his hunger fixes the sensorial stimuli into his own psychic formation, making them part of his own life. If a being experiences a great attraction to the environment, so great that his whole inner self is attracted towards it, his body undergoes a certain transformation while it becomes more or less similar to the object to which it is attracted. Once this sensitive period has passed, or the species has reached maturity, characteristics are fixed and are transmitted to the future generations. So these changes are not the result of an effort made by the adult being, who transmits the result to his children. It is rather a gift of nature. If we try to explain the transformation, we realise how difficult it is to understand it, just as it was impossible for the child to understand how it was the mother who formed the child !

These forms of life pass through a period of sensitivity, an infantile period, during which the sensitivity allows the form to transform itself. As Lamarck says — " A new function arises and new organs develop." When the period of sensitivity is over, when equilibrium has been reached, created by the effort of the life which tried to fufil a function rendered necessary by change in the environment, the maturity of the species has also been reached, and the characteristics are fixed. No more changes are required or possible.

On land, the animal's found themselves in a different environment, under more difficult conditions than those in water. We know that the fish in order to keep the waters mixed move continuously up or down, or sideways as they please. But what a difference here, upon the land! The animals on the land have a very limited power of movement. In their environment, they must seek many things for themselves. They must go forth to seek their food and water. How easy and how nice it is for the fish! They have only to open their mouths and they have all the water they need! (A shell-fish drinks upto twenty-five litres of water a second!)

The animals upon the land, must make an additional extra effort. They must fix their residence in certain special parts of the earth, in places where they can find food and water. Certainly they go forth to seek food, but the food must be where they seek. Thus we can say that the fish are like people of nomadic tribes, while the land animals are like the agricultural people who fix themselves to a special spot.

Those who fix themselves to a special spot, try to create perfection. In so fixing themselves, they also perfect themselves. We may say that each animal works on the piece of land that it has chosen. Besides this the animal takes upon itself a special function. The form of its body including all the different details, is created and fixed in relation to this very special function that the animal fulfils upon the land. The animals are faithful, intelligent, brave and strong, but only in their own particular field of specialisation. This small limit of specialisation, we call instinct. Each species has different instincts according to its specialisation. There is really a great division of work, a very refined perfection in the fulfilment of these different functions. These different specialisations act in accord with each other, because only by their united work, can the equilibrium upon earth be maintained.

Thus continuous work is done for the maintenance and restoration of this world, which we call nature. The strange thing is, that the animals are not in harmony with other species of animals. Indeed, in this seeming disharmony lies their function. If it were not for birds, that devour the insects, these emperors of olden times would become all powerful and devour everything upon the earth. As far as nature is concerned, it does not seem to be of great importance that these different animals whose function it is to preserve the equilibrium, should love each other, or that they should help each other. Each animal must be attached to its function of maintaining and restoring nature.

Nature has not always made things easy for the life it has brought forth. Many animals choose very hard and unpleasant tasks. The earthworm, continuously eats earth. The cow, developed four stomachs in order to digest the grass that it eats. Some birds eat rotting bodies. Certainly these animals do not choose this work for their own enjoyment of life, but they specialise in the kind of work which is necessary for the maintenance of the whole world — burying the dead, cleaning the environment, or sweeping the streets.

Destruction is also necessary — destroying not the whole of the species, but the surplus, so that there is only that quantity left which is needed to fulfil the function. In nature, there are insects, but there are also birds that eat insects. The birds destroy a great many insects, but not all of them. The extinction of some kinds of birds has been the cause of drought and famine in some places. So in many countries it is forbidden to kill small birds, because it was discovered that an enormous quantity of insects appeared as a direct result of their destruction, as there was then no check on the multiplication of insects. We cannot say this is good or bad. We merely observe the facts as they occur in nature.

The difference between the quantity that elephants eat when they are free in nature, and when they are kept prisoners has been calculated. When they are tamed, and kept in zoological gardens, or by some private owner, and provided abundant food as much as they want, elephants eat only one tenth of what they eat when they are free. Perhaps this is because they are happier, than when they are tamed. It has been more or less proved by facts, that when these animals are free they can fulfil the function which they are meant to fulfil. Elephants eat the leaves of the trees in enormous quantities, working on the vegetation like agriculturists, who cut off some of the branches and leaves to prune the plants for the greater welfare of the plants themselves. The curious fact is that they do not devour all the green things that they find. Only when there is an abundance of a certain type of vegetation do the elephants remain in a place. When they have eaten a sufficient quantity to keep the plants pruned, (they do not destroy the whole plant, although there is nothing to prevent them from eating the whole tree, trunk and all) the elephants migrate to another place. Who tells the elephants, after they have finished eating the abundance of leaves in one place, to go away to another place? Their function is merely to eat, after all. They could eat and destroy all the leaves and plants. Yet they go away!

It is curious that each animal eats one special food and thus carries out its special function. When we buy an animal as a pet, we ask what it eats. Sometimes these special foods are the strangest ones imaginable. Some animals eat only seeds, some only insects, while some others eat only grass. There are hundreds of such examples.

This idea of the cosmic function, of all creatures has entered the conception of modern science[1] to such an extent that it has been introduced in detail even for children.

---

1. Ecology is a branch of science that deals with the relationships living things have with each other and to their environment. Although it is considered a branch of biology, ecologists use knowledge from many disciplines including chemistry, physics, mathematics, geology, climatology, and oceanography, to name just a few. Ecologists study the organisation of the natural world on three main levels — populations, communities and ecosystems. Breakthroughs in the study of genetics and evolution at the turn of the century resulted in dramatic developments in the field of ecology. Since the sixties, concern about the effects of pollution has greatly stimulated the research. Dr. Montessori's approach to the cosmic task, thus places her not only as one of the most well read and up-to-date person in her own time but also as a forerunner to ideas surfacing today as we approach the turn of the next century. At this point in the originl manuscript she draws attention to the need to introduce ecology to the child and the necessity for good books to support this.

Thus every animal of the earth is a specialised worker, which has taken upon itself a refined task — high work for the benefit of all. Each animal, little or big must be free to carry out its special work. When an animal acquires a function and becomes perfect, a work of artistic beauty is carried out. This is the evolution of a civilisation.

CHAPTER 32

In the Number Frame that we saw in the decimal system, there were nine beads[1] in every row in each category. Here we have a similar frame in which each row of beads represents the hierarchies from the units to the millions. This Number Frame is different from the one which went from one upto a thousand, which was used in the addition and subtraction at first. It is used, among other things, in order to make the connection between the concrete and the abstract clear. We have to pass from the materials into abstraction very slowly and gradually. Later on we have to show how the abstraction is derived and what it means. If we omit this last step, we leave two things isolated in the mind of the child which may bring about more confusion rather than clarity. We also have the charts that were used in the decimal system for the addition and subtraction in which the symbols were written down in each hierarchy up to nine, one below the other in different colours, green for the simple units, blue for the tens, red for the hundreds and green for the thousands.

We have a multiplication — 325 multiplied by 54. In the decimal system we used to represent these numbers with a card of 300, a card of 20 and a card of 5. We know that multiplication is a special kind of addition. We can split

1. Today there are *ten* beads on each hierarchy. See Chapter 20 for more information.

325 into 3 hundreds, 2 tens and 5 units. So we have — (300 + 20 + 5) × 4 + (300 + 20 ×5) ×50.

In this Number Frame the counting is by tens. If we want to multiply 20 by 10, we count 2 ten times. The 20 contains 2 tens, and so 2 counted ten times will give the result. When multiplying, (300 + 20 + 5) × 54 becomes (300 × 10)+(20 × 10 +(5 × 10) × 5 +(300 + 20 + 5) × 4. So in the multiplier, the 50 disappears and the 5 appears, because 50 is ten times 5 and the ten times 300, 20 and 5 are easily formed by placing a zero after them. So the numbers are first multiplied by 10 and then by 5. As the children already know the multiplication table the rest of the work is easy. We get (300 + 20 + 4) × 4 + (3,000 + 200 + 50) × 5. The child can carry on the multiplication on the Number Frame. First the unit 5 is multiplied by 4 which is equal to 20 and that is 2 tens. Then the multiplication moves to the line of the tens and you have 4 times 20 which is 80 and that is 8 tens. In the hierarchy of hundreds we have 300 multiplied by 4 which is 1,200 and equal to 12 hundreds. So we get — 1,200 + 80 + 20 = 1,300. When we multiplied the numbers by 50 we split the multiplier into 10 and 5 because 10 times 5 is equal to 50. When we multiplied it by 10, we saw that by the addition of a zero to each number the result was obtained — 300 became 3,000, 20 became 200, and 5 became 50. We have to multiply this by 5. So we get — 15,000 + 1,000 + 250 = 16,250. Then we add both the results — 1300 + 16250. The result of the multiplication is 17,550.

Thus this Number Frame is presented to the child in order to help him connect with the abstract, in order to help him grasp the method of multiplication without material. The multiplicaton can be done on the Number Frame, first by multiplying 325 by 4 and then by 5. First we multiply 325 by 4, placing the beads according to their hierarchy, starting with the units, and we get 1,300. Then we multiply

325 by 5 and add a zero at the end in the unit place, starting from the tens place, because we have to add a zero for multiplying by ten (50). In this part of the long multiplication, the connection between the material and the abstraction is also brought home.

We can offer to the child, an important part of geometry — the mensuration of angles. We first measure the right angle but this is not a unit of measure. It is only a touch stone, we might say, because everything is compared with it. An angle is either bigger or smaller than a right angle — those that are smaller than the right angle are called acute angles and those that are bigger than the right angle are called obtuse angles. Angles even bigger than the obtuse angles are called plane[1] angles. All angles are measured in degrees. When we say that the angle is equal to one tenth of a circle it is 36 degrees. One fourth of a circle is a right angle and is equal to 90 degrees, and half a circle is a plane angle equal to 180 degrees. There is a circle of ten centimetres diameter, made of a thick copper plate, which is divided into 360 degrees. At the zero degree there is a red line equal to the length of the radius of the circle. We place the side of the angle that we want to measure on the red zero line, and read the number on the circle which the other side indicates. We also show the child how to represent the degrees of the angle in writing, for instance — 36°.

We can also do addition, subtraction, multiplication and division with the angles. The material used for these sums is the same as that used for fractions.

First we start with the addition of two angles, placing them one next to the other starting from the red zero line. We read the number indicated by the second piece which is the sum of the two angles.

---

1. Angles less than 180 degrees are inflex angles. Angles more than 180 degrees are reflex angles. A straight angle in equal to 180 degrees.

To subtract 36 degrees from 60 degrees, we take the bigger angle (60 degrees) and place it in the circle next to the red line. Then we place the smaller angle (36 degrees) on top of the bigger angle so that two sides of both angles, coincide along 60 degrees, where the bigger angle ends. The other arm of the smaller angle indicates the answer — 24 degrees.

Multiplication is just a simplified form of addition. When we have to multiply 60 degrees by 2, we take two angles of 60 degrees and place them next to each other to get the result — 120 degrees.

To divide a plane angle which measures 180 degrees by 3, we must break it into three equal angles and measure one of them.

In our schools we offer this exercise to the child between five and six years, usually after the fractions have been shown. Sometimes the child can be shown this before the fractions. The reduction of fractions into decimals, however must be given only after the fractions are taught. We give to the child merely the first impresson of what a decimal fraction is and how it works. We have the same kind of circle that we saw for mensuration, but the markings of the angles are not by degree here. Starting from the red zero line, the circle has a 100 divisions. The markings are by tens. We take a piece of $\frac{1}{4}$ and placing one side along the red line, we read the marking on the other side, which is 25.

Once we have reduced the pieces into decimal parts, we can do addition by placing two pieces together in the circle and reading the number as before. Hence $1/2 + 1/4 = 0.50 + 0.25 = 0.75$.

To subtract 1/10 from 1/2, we place the piece representing 1/2 next to the red zero line in the circle. We place the 1/10 piece over the first piece so that the arms of the two pieces coincide along the side where it reads 50, and take the reading of the 1/10 piece along its other side, to find the result. So $1/2 - 1/10 = 0.50 - 0.10 = 0.40$.

We take 3 pieces of 1/10 and place them one next to each other in the circle and read the number indicated by the side of the last angle. This is the result. So $1/10 \times 3 = 0.10 \times 3 = 0.30$.

We break the 1/2 piece into 5 equal pieces by substituting one 1/2 piece with 5 equal pieces. Then we measure one of them and read the result. So we have — $1/2 \div 5 = 0.50 \div 5 = 0.10$.

CHAPTER 33

How can we offer the idea of cosmic philosophy to the child? It is difficult to introduce its applications in a few words, as it represents the whole field of science. Instead we may mention only a few sciences — geography, mineralogy, biology, zoology, botany and geology, and explain the relation between them.

What is generally done in traditional schools is to give notions of these different sciences as small items of knowledge, which are separate from each other. So in order to retain it, the only thing that the child can do is commit it to memory.

If we can present the different sciences as being interconnected, like a collar in which different stones are linked together to form a chain, we can attach different ideas to different cycles, and show how everything in nature is cyclic.

The study of water can be very interesting if water is presented in different ways. In this way, the properties of water are brought to our attention and hold themselves up as items of interest.

In the laboratory, water can be presented in its physical states of solid, liquid, and gas through experiments connected with the different forms of water demonstrated by freezing and evaporation.

We can also present water to the imagination of the child through its work in the world. This water, that permeates the land, which forms ice at the poles, and perpetual snows in certain, elevated parts of the earth, also forms the oceans and the rivers that network the land, and the different forms of these interesting clouds which can always be observed — these give the child a geographical vision of water.

We can also offer the child a glimpse of water in its cosmic function. Water is a great solvent, both by itself and when combined with other things. It dissolves and mixes all the elements that make up the earth.

Water in its liquid state, is also a great corrosive agent. The corrosion takes place deep under the earth as well as on its surface. The task of water is literally to pulverise great stones. The terms used for describing its work are neither inviting nor simple. The great masses of earth that have been worn down by water, are spoken of by geologists as mountains that are ill with cancer. In the thousands of years that will follow, this cancer will devour them all and they will disappear. Yet they are among the marvels of nature[1].

The child is often given a glimpse of such marvels, but they are unconnected glimpses. If we want to present the work of water, we must offer it as a whole. Everything in nature is marvellous. However, if we present unconnected marvels, it leaves a chaotic impression in the child's mind. Instead, if we link the stalactites, the stalagmites and the formation of alabaster with the water which destroys and carries away the calcium carbonate, we can reinforce for the child, the concept of the chain. The river which represents water, is one of the links in the chain. The water which absorbs certain salts of the land and carries them away into the sea, is another link. Thus the river arouses a new interest.

---

1. At this point in the original manuscript, Dr. Montessori describes in detail the various sketches that she held up in course of her lecture, showing the work of water.

Maps showing the extent of these rivers hits the imagination of the child and offers him a reality. There is no need to know the names of the rivers, or the names of the countries through which they flow, or the names of the mountains in which they have their source. It is enough just to give the child an idea of how water does all this marvellous work through facts and symbols. Thus we can enable the child to just look around, and let these facts penetrate into his mind just as sensorial impressions penetrate into his consciousness.

How strongly the child is impressed by these facts! Once a child who was eight and a half years old, was asked to represent the great river Rhine[1]. The child, who was deeply interested in the work of water wanted to represent every small detail including all the towns through which the river passed. Every minute detail was represented. It took three months to complete the work. It was wonderful to see how the geographical study that the child carried out at that time, penetrated into his mind. Once we have aroused and captured the interest of the child to look into the minutest detail in this fashion, the child absorbs much more than he intends.

Thus the problem is not how to offer culture to the child but how to offer him all the exact details he needs and asks for, with the limited knowledge that we as teachers have! For instance, there are different types of mouths of rivers, We know more or less of two types, the estuary and the delta. However there are innumerable details and classes. One poor teacher, when confronted with such questions, had to make a special and detailed study of the mouths of rivers. So the ability of the teacher in this case, did not

1. The Rhine river is one of the most important water ways of Europe. About 1,320 kms long, it arises in Eastern Switzerland, borders Austria and France, flows through Germany and the Netherlands and empties into the North Sea.

really depend on how well she could teach but on how well she could defend herself from the questions of the child!

The largest number of great rivers in the world flow into the Atlantic[1], from both sides. All the great rivers of North America[2] such as the Mississipi flow into the Atlantic. In Europe there are rivers flowing into the Black Sea[3], which in turn finally flow into the Atlantic. The great rivers of Africa[4] also flow into the Atlantic. So all this earth which has been consumed by the waters of these great rivers, is dumped in one special place, in the Atlantic, a repository of all the materials that have been taken from the lands by the various rivers instead of being scattered abroad. On the other extreme edge of America, there are all the great mountains to which all these rivers trace their source. They all flow towards the Atlantic.

The are no rivers flowing into the Pacific Ocean. The great Pacific, is a defended ocean, and indeed we may call

---

1. The Atlantic Ocean is the second largest body of water in the world, next only to the Pacific. It covers about a third of the world's water surface. It has no definite Northern or Southern boundaries. It runs into the Arctic Ocean in the North and the Antarctic Ocean in the South. Some geographers feel the Antarctic Ocean is only a part of the Pacific, Atlantic and Indian Oceans. By this definition, the Atlantic merges with the Pacific beneath South America. So too Dr. Montessori does not recognise the Arctic Ocean, stretching the boundary of the Atlantic upto Bering Strait which lies along the coast of Alaska.

2. The rivers of North America which flow into the Atlantic directly, include Delaware, Hudson, James Potomac, Roanoke, and the Savannah. The rivers that flow into the Gulf of Mexico, and thus into the Atlantic, are Alabama, Mississipi, Rio Grande and Trinity. In South America the rivers that flow into the Atlantic incude Orinocco, Amazon and Parana.

3. In Europe, the Tagus and the Douro arise in Spain, flow through Portugal and into the Atlantic. However the Atlantic is connected to the Black Sea through the Mediterranean. Important rivers that flow into the Black Sea are Danube, Dnestr, Dnepr, and Don.

4. Some of the African rivers that flow into the Atlantic include Senegal, Benue, Congo, Niger and Orange.

it a place of peace. Though some rivers of Asia seem to flow into the Pacific Ocean, we can see that between the Pacific and the land from which the rivers flow, is a stoppage which channels the waters down the coast of Asia, and away from the Pacific. In the Pacific, this place which has been left in peace, reconstruction takes place. All the materials carried by the rivers are dumped in the Atlantic, but the reconstruction occurs in the Pacific. How is this possible? In the modern world, there are great industrial centres, where all around is smoke and dirt. The conditions of living are very bad in these centres. Howcver a certain amount of stock produced there is sent to the nearest cities, from where they are slowly distributed all over the world. So there is an unhygienic spot where the production occurs, and there is a slow and gradual transport of these elaborate stuffs until they reach the distant parts of the world! This slow transport of the matter consumed by the rivers is one of the most marvellous studies that we can make of the oceans. In the end, the elaborate produce reaches the Pacific Ocean. The reconstruction occurs, and coral islands are formed. Enormous continents are under formation in the bosom of the Pacific Ocean. They may be greater than Asia when finished! Meanwhile, the coral islands of the Pacific form stepping stones for men who fly across it.

We can thus study two sides of the work of water — that which destroys and that which reconstructs life again. The corals build on mountains that lie under the water. The tops rise above the water level. Sometimes they form a coral ring around a land portion, so that there is a lagoon left in the middle. Coconuts which come floating on the water somtimes land and take root. Thus coral islands are formed. In certain other parts of the ocean we may find another kind of island formed by water — icebergs which are literally floating islands. Along with coral islands icebergs may also serve to kindle the imagination of the child. We can classify the animals of the sea into two groups — the secreting animals, the foraminifera and the corals, and the mixers of the water, the fish. The fish, are found in great masses. The stone is eroded and consumed, and the shellfish build up the stone again. If we study calcareous stones, and begin to take into consideration the calcium carbonate which assumes so many forms, we enter the field of mineralogy.

There is another striking parallel between the water as destroyer and reconstructor of the land. The water in its minutest form becomes solid until we have snow crystals. On the other hand we have the construction achieved by the minutest animal of the sea, by the skeletons of the foraminifera, which have so many different forms. There is freedom of work, each one an independent artist elaborating the calcium carbonate in its own imaginative form. The different forms are marvellous and remind us of the different forms that water assumes when it crystallises.

We can kindle the child's interest, arouse his imagination, and penetrate into his mind, by offering him very exact facts. For instance, if we tell a child that the Amazon is a very great river, it does arouse his imagination, but if we offer him something exact, we may help the child to understand how big the Amazon really is. To a child in London, the Thames is a great river and is literally at the centre of the world. So if we tell him that the Amazon is a very great river, he imagines that it is as big as the Thames. If however, we give him a map of the Thames, and the Amazon, drawn to the same scale, he can more easily understand the difference.

There is another way to help the child's imagination, besides comparative study. The child begins his mathematical experience in our schools, in close contact with reality — a big number and its representation by means of beads.

He understands the significance of the numbers. So we can offer the child exact statistics, in an interesting fashion to help him realise the greatness of the figures that we give. For instance, the Rhine, not a big river as rivers go, brings down in one year enough calcium carbonate to enable three hundred thousand million oysters to make their shells. The Mississippi brings into the ocean twenty thousand cubic metres of calcium carbonate per second, which represents seventy thousand million kilograms in one year. Such numbers help the mind of the child to imagine. If these two rivers alone bring so much of stone, how much land is brought into the ocean every year by all the rivers which network the land! Indeed it seems as if the ocean is finally growing to consume all the land.

If we say, that in the sea there are an infinite number of fish, our imagination is not kindled. We think that we have given the child the idea of something great when we say the word infinite. However the word will not make him realise the greatness. We must help the child to understand this enormity of the infinite quantity. There are shoals of cod fish that travel in groups. They swim close to each other, so as almost to touch each other. They gather together and form banks. There are living shoals of these fish, that in some cases extend twenty four square miles. They are so tightly packed together that they look like the packed sands of the seashore. When men go to catch these fish, they disperse themselves and run away. Nevertheless, every year 40 million cod fish are sold in America!

A clearer idea can sometimes be given by the occurence of some event which has cataclysmic effects on the fish, perhaps an accident that happens in the sea. Once a shoal of anchovies sought refuge in a bay. Some dolphins placed themselves around the entrance to the bay which was very narrow and did not allow the anchovies to retreat. The fishermen were very happy. They did not have to go to fish because the fish had come to them! They gathered the fish in great masses. This bay was so completely packed with the anchovies, and with fish that were there before the anchovies came, that many fish died. The smell of the dead fish could be smelt across the ocean! It was so bad that the fishermen had to leave their town and go to distant places to be free of the smell. After three months, when they returned to their homes near the bay, the waves of the ocean were still throwing up the flesh and skeletons of the rotten fish! This gives us an idea of the really immense quantity of fish that are in the sea.

If we stop to think of the progeny that fish produce, we cannot be surprised. One cod fish alone produces one million eggs a year! The population figures for the vertebrates are very great. However their numbers are nothing compared to the softbodied invertebrates, in the case of whom numbers are no longer sufficient to express the quantity of their progeny! To express these numbers, we have to recourse to time instead of numbers. Once it took a liner six days to cross the shoals of packed masses of jelly fish!

When there is such a great mass of life, there must be a great function that this mass is carrying out, in order to keep up the cosmic equilibrium of our earth. If we can conceptualise the number of creatures of different species that live in the sea and upon the land, each with its own function, carried out in accord with all the others, we might think of all of them as working energies. On one side, we see the force of destruction and on the other side the force that rebuilds. The force that rebuilds is always life — life that builds for itself the home. The reconstructing energy of nature, is an abstraction. Its task is the upkeep of nature, and the maintenance of its equilibrium. This energy is life. We say that the world is enveloped by what we call the atmosphere. We can also say that the whole world is enveloped by this energy. Indeed the scientists of today, speak of a biosphere — a sphere of life — which surrounds the earth just like the air.

A great deal of material must be prepared for the children. A great many charts must be made, and a great many tales and anecdotes must be gathered. All these different items of knowledge must be linked together in an orderly fashion. They must be presented so that they do not cause the child mental fatigue, but act as mental excitement, and become the motor which seeks more knowledge.

This then is our task, to gather the highest discoveries that have been made in the sciences, to render them clear and fascinating, and offer them to childhood. We must set up for this purpose an Institute of Pedagogical Construction[1] where studies can be carried out in a serious fashion. The elements of these studies, the elements of modern science, already exist, and are just beginning to take root. They have yet to be linked up, and reduced to a form which the child can absorb easily. Today we live in a world in which daily the individual needs more and more. If we start a Centre,[2] in which we can collect and construct all these, we can meet the needs of children all over the world, and furnish them with the means to acquire the whole knowledge of the sciences, along with the human side of social life, in a manner which keeps their intellectual life growing.

---

1. In the original manuscript, at this point Dr. Montessori describes such a centre set up in Holland by some of her students who took the two year course. Enthralled by the vision, they enthusiastically researched different areas of study to make new material for the children.

2. Dr. Montessori's dream to start such a centre, an ashram of peace, was discussed as a possiblity throughout her ten intermittent years of work in India. However it remains unfulfilled to this day.

CHAPTER 34

All creation is based upon energy, upon forces. One of these is the force of gravity, the force of attraction between objects. This force acts upon all bodies without variation. There is also another sort of attraction — a magnetised piece of steel[1] attracts pieces of iron. When the object attracted by the magnet is detached from it, the magnet remains as before. This force of attraction can be demonstrated in many ways, by experiments which can be done in front of the child. For instance, if we put some tiny little pieces of paper inside a glass full of water, we see that until a certain equilibrium is reached, the larger pieces of paper attract the smaller ones. Also, after a time all the pieces, instead of being at the centre, are attracted by the sides of the tumbler. There is another surprising kind of union — a secret force of nature. Certain elements have a strong attraction for each other. When they join together, they become so utterly transformed, that they lose all their properties and acquire new ones. This gives us an idea of the creation of the world.

Let us think about the components of water. Water is formed by two different gases — one of them keeps the flame alive, and the other explodes when it comes into contact with a flame. Both are invisible. One gas is lighter

1. Dr. Montessori at this point of her lecture practically demonstrated the use of a magnet with some iron filings.

than the other. All of a sudden, these two gases, burning explosive elements which are light and invisible, join together and form water which puts out all flame! Thus we know that there are elements which join together and form other substances. This is not a casual meeting. In order that they may join together, the elements must have a certain attraction for each other. We call this chemical affinity. What is this if not creation?

If we tell a child that sugar is made of coal, the child will not believe us. He will laugh because there is no similarity between sugar and coal. Sugar is sweet and can be eaten but coal cannot. Moreover sugar is white and coal is black. We can kindle the imagination of the child by performing an experiment. First we place some white sugar inside a glass. Then we pour a little pure sulphuric acid over it, and stir the mixture with a glass rod. After a while it turns black, and smoke comes out of the tumbler. Soon a solid lump of black coal is formed in the tumbler. A piece of coal which did not exist earlier, is now a reality.

All things are formed by chemical composition. The most important thing is not the creation of these new substances, but that only certain bodies when joined together can form a new substance. The force of gravity is general and is the same for all bodies. A piece of stone, a glass, or a feather, all these are attracted towards the earth. The force of chemical attraction only occurs between certain special elements that have an affinity. This affinity is necessary so that new substances may be formed. The propinquity of bodies alone is not sufficient. A chemical action thus begins to restrict this phenomenon, and to make special groups. It is as though all the elements that exist in the universe have also received a higher command. Only those special kinds of elements that have an attraction can be mixed together, and only in that special proportion. Out of chaos, a given order reveals itself. So creation lies not so much in the coming together of elements, but in this order.

There is yet another kind of attraction — the active phenomenon of life. Sea water contains many salts that are all mixed up together. Certain secreting animals, have the power of choosing only one special salt — calcium carbonate — out of all the salts found mixed in the sea water, leaving all the rest. This is marvellous in itself. This kind of attraction, this choice, is the very basic characteristic of all life. For instance, there are a great many substances in the blood, but the tissues take from it only that special substance which they need. They choose what they want out of the quantity of things which are brought to them, and by this choice form new substances. Thus all new substances are formed through physical or chemical forces, or through the force of life which contains them all.

In physical life what holds humanity together? A force which we call love, which is nothing but an attraction. Out of the whole of humanity, each human being is only attracted towards a certain person, or a group of people!

Gravity, we might say, is like universal love. We all feel the same kind of love for each other, just as all bodies feel the gravity of the earth, sooner or later having to come in contact with the earth which is pulling them. So both in the organic and inorganic worlds, the animate and inanimate worlds, we see all these different forms of attraction — some general, some limited. Each one obeys certain laws. Yet we can say that all creation is the fruit of love.

For the study of chemistry, we give to the child a material[1] which can be handled. Each element is represented in a

1. From the original manuscript the following material description has been culled as accurately as possible. It appears that the material to demonstrate the structure of molecules was made of loose, hard, coloured discs. Carbon was black with 4 arms. Nitrogen (colour?) had 3 arms. Oxygen was red with 2 arms. Hydrogen was blue with 1 arm.

symbolic way, by a circle. Four circles thus represent four elements, which are the centre of almost all the constructions that occur in nature. Each circle has one or more arms. The first circle which has only one arm is hydrogen. The second circle, which has two arms is oxygen. The next circle which has three arms is nitrogen. The fourth circle which has four arms is carbon. The arms of the circles are always represented outstretched, ready to grasp each other when they join together. However to grasp each other, first of all there must be a special attraction between the elements, a chemical affinity. These elements follow one law — they cannot grasp anything if all the arms cannot grasp it in similar quantities. An element which has three arms must grasp a thing for each of the three arms. The second element, oxygen is represented by a circle with two arms. It can take two circles of the hydrogen each of which has only one arm. However in order to be able to grasp the hydrogen, it is not enough to have arms alone. There must be an affinity, an attraction. When all these conditions are satisfied, a certain chemical phenomenon occurs, and a new substance is formed. The oxygen with two arms, can take two hydrogens, each with only one arm, H_2O. This is the formula for water. The valency of hydrogen which has only one arm, is 1. The valency of oxygen, which has two arms, is 2. Theoretically, carbon with its four arms should be able to take four of the hydrogen, each with only one arm. However there is no chemical affinity, no attraction. Carbon feels an attraction only for oxygen. Carbon has four arms. With two arms it takes the two arms of the oxygen, and with the two other arms left it grasps another two arms of oxyen, thus forming CO_2. This is the formula for carbon dioxide, the famous gas which the plants, our friends, eliminate from the air for our sake. Similarly, nitrogen has three arms. Nitrous acid has two oxygen, one hydrogen and one nitrogen — HNO_2. Thus the two elements, water and carbon dioxide, can be presented as chemical formulae.

If we know the valencies of these elements, it is very interesting to see the combinations that can be made with them. Just as in the Division Chart there were the numbers which when divided gave exact results and left no remainders, we can also have a kind of chart which tells us which elements feel affinity. When a chemical reaction takes place, a great transformation occurs. When water is strongly impregnated with carbon dioxide, it reacts with calcium carbonate[1] which is freed and carried away by the water. This is why all the mountains slowly disappear. So using this material made of little discs, we can make many combinations which are theoretically possible but practically impossible because of the lack of affinity. The reactions are very limited, very precise, and constant. Calcium carbonate remains in the stone for centuries and centuries, and water always remains in the same state of purity. So the main characteristic of these forms is their constancy, and that special choice of the elements for which the others feel affinity. There are certain rules that determine the exchange of certain elements. To understand these rules, we must enter into the theoretical formation of the formulae of chemistry.

When life takes part in these combinations, a despotic force comes into play, which does not pay any attention to chemical affinity, to that faithfulness and loyalty that kept these small groups together. When this happens, the need of the elements to be attached to their laws, suddenly disappears. We call this inorganic chemistry. The atoms have certain instincts, which compel them towards certain other atoms in a certain fashion. This is something that comes

---

1. In the original manuscript this chemical reaction has been explained in great detail. However, as many areas were unclear, it has been deleted to establish continuity.

from within. However when the despotic energy of life comes into play, it does not mind any of these affinities at all. The only aim of life is to make himself an emperor, and to make an empire which pleases him. To this end, he disregards all the atoms, the elements and forces. The formula becomes very, very complicated. However, carbon, is always the centre which holds all these different elements together in combination. Indeed, if we burn anything which is organic, only coal remains. In the formulae for starch and sugar, the elements that combine are the same, but their arrangements differ. This gives us one of the extraordinary cosmic truths about simple elements. The elements of organic substances, which we also call the nourishing substances, are not in their natural position. They do not obey the natural laws of inorganic chemistry. They are kept apart.

What then is the aspiration of these life formulae? It is the liberation from the tyranny of these forces, and its work is to separate those which form their own little natural groups, like carbon dioxide, water and so on. Among human beings too, we find the same laws. They too seek to form their small groups, as the atoms do. When life ceases, the tyrant is finished. The body decomposes. All the substances which were held together in a grip of iron by life, once again form the little groups for which they aspired during the entire period of life — ammonia, carbon, water and so on. These little groups fall again into the hands of a tyrant. So another body comes into being, another form which is held by the tyrant until death[1].

---

1. For more information see Dr. Montessori's book *From Childhood to Adolescence.*

CHAPTER 35

One of the most complex universal cycles is that of matter. Matter remains constant in its quantity, but undergoes transformation, and circulates in different forms. Life in its most primitive form is vegetable life, which has a very important rôle to play in the upkeep of social life equilibrium. It prepares the environment for animal life. This is not its only role. Vegetable life upon the earth can be found in such extraordinary abundance, that it goes far beyond the needs of animal life. It meets the needs of the earth itself. Carbon dioxide, is noxious to life. It destroys rocks when combined with certain salts. It is emitted by all living beings, even man, while breathing. Enormous rivers of carbon dioxide are thrown into the atmosphere by various agents. It is therefore necessary to have this enormous quantity of vegetable life which, except for the deserts, covers the whole of earth. So among the tasks of vegetable life is the elimination and transformation of carbon dioxide, in relation, not only with the needs of animal life, but with the needs of the world itself.

This very special ability, works through chemistry. Carbon dioxide is transformed into oxygen and carbon, through the medium of a green substance called chlorophyll present in the leaves. Chlorophyll by itself cannot do anything. Only when it is exposed to light, does it have the power of dissociating the carbon from the oxygen. Thus vegetable life is in close relation both with the earth and the sun. What greater cosmic relation could there be?

The maintenance of the purity of the air is the great task of vegetable life. Without this cosmic work of the plants, no animal life could live. What grandeur of conception is seen in the preparation of the environment for the animals! They live and work peacefully, without doing anything to keep the air pure. How different is life in the water, where every living being has to take part in the task of keeping the water pure! When animals breathe giving out carbon dioxide, leaves which are in direct contact with the rays of the sun, avidly gulp down all the carbon, and throw the oxygen back into the atmosphere. Plants are great devourers of carbon. The more carbon they have, the more they would like to have! The greater the amount of carbon dioxide in the environment, the richer the vegetation. The carbon molecules that are swallowed by the plants through their leaves meet with the water molecules that are sucked from the ground by the roots. Along with water, the roots also absorb nitric salts. This is true not only of trees, but all green growing vegetable life. Within the plants the inorganic molecules meet together and form the most complicated mass we can imagine. This is the mysterious and secret task of vegetable life. Life dominates all the small, scattered elements and ties them together with a command, keeping them united. Sometimes substances are formed merely by keeping together two elements — water and carbon. Animals feed upon these complicated substances that we call food. We must recognise the merits of these great workers. They are the most self-sacrificing and heroic beings we can find! They keep the air pure so that the animals need not work to keep it pure for themselves. They also prepare food for the animal world in one form or another, in their roots, in their stalks, or in their fruits.

Elements with chemical affinity, which have a strong attraction for each other, form small groups which are more difficult to break. They seem to have no limit. Such substances have enormous powers. For instance, sulphuric acid and nitric acid generate a tremendous and a wild energy. In fact, wars are won by the use of explosives, which are violent in their tempers and reactions.

Vegetable life also forms certain mild acids, which have very marked functions. These organic acids are always at the command of the tyrant — life. Butteric acid found in butter which is rancid, palmuthic acid, an acid made from palm oil, pleasant acids which are mixed with other things to make soaps — the basis is always carbon. What do we get when we burn a tree? It is always blackcoal. So, vegetables produce food substances for the animals.

The animals upon land are not, as in the case of the beings in the sea, condemned to eat one another. So vegetable life should also deliver animals from the painful task of devouring each other! Rich as they are in themselves, their life is not so closely related to, or dependent on that of the animals. They can prepare the food that everyone needs. Why then do the animals still devour each other when there is sufficient food for everybody? This is because they obey another law of equilibrium, of keeping certain other animal species in check. Thus on land too, as in the sea, the devourers act as the police that keep the order. There are animals which keep the environment clean, who devour all the things which make the environment dirty. This is a task of service to common welfare that they take upon themselves.

The animals are also careful in their turn, to return to vegetable life everything that they have received. While breathing, they give out carbon dioxide. While digesting they form what is called humus, manure which is of great help to vegetable life. Animals are like great chemical laboratories. They form very complicated compounds, some of them having more than three hundred elements! Some animals also form food substances in themselves —

the cow makes the milk.

Thus we can see the difference between the work in nature and in life. In nature there is tremendous affinity and tremendous force. In both animate and inanimate nature there is chemical affinity which keeps the things together by means of the attraction that one element has for another. However life molecules are artificially held together, not by the love that they have for one another, but because a dictator keeps them together, to form food substances. When the whip hand of the dictator is no longer there, the bonds are broken, and all the slaves kept together are freed. They scatter, and break up, arriving at the four primitive elements, water, carbon dioxide, ammonia and nitrogenous substances, and resume at once their historical costumes and their austere formations for which they have affinity and liking. Even the most complex organisms break up into these few vital elements. When water is formed from life that has ceased to exist, it penetrates everywhere. At once life is everywhere. The carbon dioxide emitted by animal life is absorbed by plants. The nitrogenous substances are sucked up from the earth by the roots of the plants, along with water. What is left in the ground is ammonia.

Very few people realise the fact that a body which has been buried, also reduces itself to these simple elements. Sometimes we do realise it with our minds but it is quite different to realise it with our senses. Once, in Rome, as a doctor and as a scientist, I was present at the exhumation of dead bodies[1]. Every ten years the dead bodies of the poor were removed to make place for new graves, as there was no space left unoccupied. As they excavated the graves of the poor, who were usually buried in very light wooden boxes, nothing appeared. Going down further,

---

1. Dr. Montessori mentions this incident in her book *From Childhood to Adolescence* (Chapter 10)

they only found the cranium. All the rest — the wood, the clothes, the flesh, the bones — had disappeared. Only black earth was left — earth in which vegetable life finds its best nourishment[1].

In this cycle of matter, after the groups have divided themselves into the elements which disappear, ammonia (NH_3) is left in the ground. This ammonia, an active poison which kills plants, is the greatest product in the decomposition of animal life. The composition of the nitrogenous substances on which plants do nourish themselves is very different. If we wanted to make it in the laboratory, it would be a very difficult task, one which remained unaccomplished for many, many centuries. Only lately has it been possible to do it, by using very powerful means. In nature, there are certain nitrogenous microbes whose only task is to drink up a little bit of hydrogen, another microbe brings oxygen, and Nitric acid ($N H O_3$) is formed. This acid spontaneously forms nitrogenous salts, which are the best nourishment for plants and absorbed by them as food.

So the cycle of matter is complete. All living beings take part in the task of the upkeep of the equilibrium, of keeping things in circulation. Not even a breath is wasted. Even microscopic organisms, take part in this most important of tasks. The animals, that keep order in the environment, find pure air to breathe and food to eat. Plants continuously purify the air, and gather all the waste products which have been thrown away as useless and dead, and build up reserves of food and coal.

If we study the cosmic tasks, we find ourselves confronted with a degree of self-abnegation and self-sacrifice of which we cannot conceive. It becomes evident that when we talk about living for others, and sacrificing ourselves

1. The cranium refers to the skull, or to a large part of it. In this case however the entire skeleton of the body should have been left.

for them we are but miserable beings with miserable conceptions. We are limited by what we can measure and with what we perceive to exist in reality. When we sacrifice for others, we offer only that which is a surplus for us. Upon this, we form miserable ideas of our own worth and value. What might we say when asked — " What do you do for the good of others?" We think of the little things that we do and say — " We pay a rupee a day, so that a school may be kept. However we want to know how it is spent. It is our right after all. We give money for the good of the whole school, so we must see their balance sheet! " Or if we go to visit a person who is ill, we say — " What nice fellows we are! We could have gone to a dance, or spent the evening seeking pleasure. Instead we visited a friend in the hospital. We have even exposed our lives to danger. How good and virtuous we are! " We have a very poor idea of the power of sacrifice.

Yet human sentiments, cannot be so miserable, so mean and so low. Surely we must be capable of more! There is something within man, of which he is not aware. When we think about it consciously we can pick up only these little things. We could ask the plants — " What do you do in life? " They would say — " We are rich and proud. We devour carbon dioxide all the time and release oxygen. Sometimes, we make a small sacrifice because we cannot help making it! For instance, an elephant may pass under us and and break off a branch as food." Perhaps if plants and animals were also conscious of what they do, they would also be completely unconscious of the great aim that they fulfil, of the enormous task that they carry out. It is only when we look at the cosmic function, that we find the greatness that we seek, an inherent greatness, which is the birthright of each animate and inanimate being, from grass to man.

CHAPTER 36

The different parts of speech are grouped into what we call families. The noun, the adjective and the article form one such family. The verb, the adverb and the pronoun go together as another group. There are parts of speech which connect some others or indicate their position. They are the conjunction and the preposition. Lastly, there is the interjection, which is not of much importance at all.

First, we offer a collection of nouns that have a phonetic spelling. Then we offer a collection which has some phonetic and some non-phonetic nouns[1], for instance *pea*, pronounced differently from the sound of the letters composing them. If the child locates all the cards with the objects that have phonetic nouns, by elimination he will locate the object which is left out, with a non-phonetic name, and learn it. He may seek the help of the adult saying that *pea* was the only word that he could not read. At the same time, he may realise that the word written on the card represents the object left over, and that therefore it must be *pea*. The phenomenon, of the child saying that he cannot read the word *pea*, while at the same time absorbing that it is

---

1. Many different activites have recently been devised to follow this early reading activity of matching a slip to its phonetic object, (today called Object Box I). The child is offered phonograms in which two letters stand for a single sound. He is also offered the Reading Folders (first developed in England) in which he understands that sounds can be represented in different ways.

that word, may appear strange. However the child only means that he could not read the word according to the letters on the card.

The adult can explain to the child how the non-phonetic word is pronounced and that the combination *ea* represents a special sound. The child's interest is immediately aroused. The adult must then take care to include this combination in other words offered to the child. Only when this is clear to the child do we offer other non-phonetic collections, in each case taking care that the objects are very familiar to the child.

Following this, all the collections that we offer in geography or biology, of which the child has some experience from the age of three years, can be presented to the child in two forms. We first offer the pictures with their names written against them. When the child is very familiar with these names we can offer the pictures separately along with individual cards bearing the names.

We can then introduce the article and its function. This is the second part of speech which is introduced to the child. We give the child a piece of paper on which an article appears along with a noun. The child, places the paper next to the object specified. We can also offer at this time gender and number of nouns, their definition and function.

Now, the adjective and its function can be introduced. At this stage the child must not be asked to recite the definition of the different parts of speech. Instead he can be asked to identify and distinguish each of them by placing appropriately on top of the word, the symbol representing its function. First the child reads the phrase that he is offered — *the cup*. We then ask the child to place the black triangle on top of the noun in the phrase. Then we can ask the child to identify the article and to place the symbol on top of the word. Then if we have several cups, we can ask the child to get the blue cup. He must identify the word which distinguishes one object from another. The child can place the adjective symbol over the word blue and thus describe the function of the adjective.

What holds good for reading exercises also holds good for the grammar lesson. We must arouse the interest of the child. Most people think that our teachers should be inactive. In fact, there is no one as active as our teachers out of school. In school, she is active for the soul, and the intelligence of the child. A piece of wood placed in the hands of the child is merely a piece of wood. The child may play horses with it or even break the head of another child with it. Our material is not magical that when it is touched the whole world bows to it. To prepare the intelligence of the child, and to kindle his interest is simple. The material is self-didactic, and when once the lesson is given, enthusiasm and interest follow with ease. This is true even in the case of language. It is only after the lesson, that the material will be of interest to the child. While giving the lesson, we must keep in mind that we have to arouse the interest of the child. Therefore the lesson should be lively and exciting and not one in which all go to sleep, the teacher included !

Next, we come to the verbs. They can be offered to the child through exciting lessons. The verb is full of actions and offers the opportunity for great gaiety and simple jokes to which the child responds, by which we can make the child understand the meaning of the verb. There are several things to be distinguished. We may best do it through a series of separate exercises.

First of all, we must make the distinction between the function of nouns and that of verbs clear. In order to demonstrate to the child that the verb means an action that has been done or is being done, we can give a collective lesson. We can thus awaken the interest of the child to the meaning of the verb. We tell one child — "Walk !" We tell another — "Clean the vessel !" The children will immediately see the difference between the transitive and intransitive verbs. In the case of the transitive verbs, as soon as the action is finished — the vessel is cleaned, the water is drunk, or the book is brought — the action is complete. However the child who is walking may keep walking for a long time, and continue to do so until he is asked to sit down or stop. The intransitive verb is not contained in any definite time frame, the action may continue for one second or one year.

In order to arouse the interest of the child, we can offer the children another collective game. We need several collections of objects which will remain solid, and immovable without any change. The actions do not remain when they are finished. When the child stops walking, or singing, absolutely nothing of the action remains. The substantial objects remain solid, and indestructible. In this way, we can make the child see the difference between the verb which is action, which is life, and the noun.

We can also demonstrate the relation between the object and the action, by asking the child to place the object in different places, indicating the place with prepositions — *under* the table, *on* the shelf. When the action of placing the objects in their respective position has been carried out, the objects have changed their places, but they remain absolutely the same, and do not undergo any change in their form at all. The function of the verb thus becomes clear. It is the movement, the action, the power which makes objects move. No change is brought about in the objects themselves.

Another exercise gives the relative duration of the present tense and the past tense. We offer one child an action which lasts a very long time — *lay the table* and another which lasts a very short time — *drink the water.* We must ask each child to tell us when he has finished. So, the child asked to drink the water, as soon as he has finished drinking, will say — " I have drunk the water." The one who has to prepare the table will take a long time before saying — " I have laid the table ." Both have done the action. Both were in the present, and both are now in the past. The difference between the actions is not absolute, but relative, according to the time taken for the action.

So, through these collective exercises, all the functions of the different parts of speech become clear. We cannot make the child understand these concepts by reciting the rules one after another. We must therefore have a clear idea in our own minds as to what we want the child to realise.

We can also show the child that some verbs need an object to carry out the action, while in certain others it is not necessary to have any object. We ask a child to walk. We also ask a child to eat. No object is required for carrying out the first action — walk. In the latter case, the child will ask — " Eat what ? " The second child must have something to eat, but the first child can walk without any object.

We can also show the verb as the ego. The verb is a person who talks and talks, but does very little. Once the children were sitting around me each one doing a different action. I stated all the actions — " She is cutting. He is laughing." Then I asked one child — " What are you doing ? " She replied — " Nothing, you are talking all the time but I am doing nothing." It was a very striking observation of the child. She had understood by now the meaning of the verb and its function. I can say — *He is walking*. I am saying it, so I am talking. Talk goes with the action only in the first person of the present tense in the indicative mood— *I am walking*. With all the rest, it is mere talk and nothing else.

There is another series of exercises, in the form of commands. Each command is written on a card and is an action that has to be carried out. On some cards are intransitive verbs. On some others are transitive verbs with their objects. In the begining we give only one action, just one verb. Later we can give complex actions, illustrating the functions of the different kinds of verbs.

We can demonstrate the succession of verbs, their logical order and analysis. We have a large circle, to represent the verb. There is a sentence written — *I eat the bread.* We tell the child to seek the word which indicates the action in the sentence, and to place a red circle on top of it. The child places the verb symbol on the word — *eat.* There is slip of paper[1] on which a question is written — *Who is it that eats?* The child takes out the symbol for the subject, and puts it near the other one. There is another slip on which is the question — *What is it that is eaten?* The child takes the symbol for the object, and places it next to the big red circle, on the word — *bread.* This helps the child to put the different parts of speech in their logical order. The subject and the object are also symbolised as red[2] circles (because they are all related to the verb) to distinguish them from the noun.

How interesting it is for the child to prepare and understand the mechanism of Sentence Analysis. He finds it easy to understand, as he has been prepared for this, since he was three years of age, during the conversational Question Game. At dinner, when the servant brought the soup, the child was asked a series of questions — Who brought the soup? What has the servant brought?

We have similar charts for the adverbial phrases which answer the verb. Take for instance the sentence — *Mother went to the town, in the car, with the servants, to buy a hat.* The adverbial phrases are represented by orange circles

---

1. The questions today are on black arrows.
2. Today the symbols for subject and object are black circles.

because orange is the colour of the adverb. There are arrows on which there are different questions — *Where? With whom? For what?* There are more arrows on which the extensions of time and place are written. There is also the whole adverbial chart for the control of error.

This should be offered to the child in the reading period before he has entered the field of grammar. All this is only the study of reading. It is just a collective exercise, a kind of play. There is no special teaching of grammar. What we understand by grammar is a knowledge of the rules in order to be able to define the parts of speech. While the child is reading he builds the foundation for grammar.

We have another material, we call Grammar Boxes. They are not like grammar books, which are boring and horrible to read, being just one set of rules after another. Grammar, is like a beautiful novel. It must be illustrated with beautiful colours offering the philosophy of words to the child, in the most appealing manner possible. Grammar Boxes make the child conscious, of what he knows subconsciously. These boxes are of different colours. The verb is red and therefore the colour of the box for verbs is also red. The colour of the box for the article is light brown. The adjective is in dark brown and the box for the adjective is also painted in that colour[1]. We must introduce the child to the special names of these parts of speech. When he takes out the boxes he realises that one is a noun, and the other is an adjective, and so on, by their different colours. the name of the part of speech it holds, is written on top of the compartment. So this material is self-didactic.

First we must make the child understand that we can make all the sentences with only one article, and that the same article can be used for all the other sentences that may follow. Therefore it is not necessary to have as many

---

1. Today the colour of the article is light blue, and the colour of adjective is dark blue.

articles as there are sentences to be made. The same is true of the adjective. It is sufficient if one adjective is in the compartment. For instance, there may be a card, on which is written — *the dirty cloth.* There may be another card on which is written — *the clean cloth.* The noun is the same, but there are two words in the sentence doing the function of the adjective. The child will, by choosing the adjective for the two sentences, grasp the function of the adjective. This will not happen, if there are as many cards in the compartments of the box as there are words in all the sentences put together. There are symbols with the Grammar Boxes also. The symbols are placed on top of the words in the sentence that is analysed as usual.

The child, with this material, also learns the order of the words in the sentence — the order of the different parts of speech. For instance, he cannot say — *the cloth clean.* He must say — *the clean cloth.* So the exact order and exact position of words in English must also be maintained. The order of the words must make sense. The child may shriek wih laughter if he sees a combination such as — *The rat eats the cat.*

There are also suitable adjectives[1] that go well with certain words. In order to make this choice of suitable and appropriate adjectives clear, the child is given an exercise in which an appropriate adjective is choosen for the corresponding nouns from a group of fifty or more.

For the child the study of language and grammar is exciting. No longer do mere names and the sounds of words interest the child. He now seeks the expression of the human soul in order to fix it in his mind. He delves into any book, to find the different parts of speech, to study the different

---

1. Today we call this activity Logical Adjective Game. The nouns are written on individual black cards and corresponding adjectives are written on individual dark blue cards.

expressions, and the order in which the parts of speech are arranged. Researching into language — its beautiful expressions, its logical order — this is so much more meaningful than a mere memorising of the definitions of the different parts of speech. Thus, gradually the child becomes subconsciously conscious of the whole of grammar, beautifully and clearly.

CHAPTER 37

"To the animals which live on the globe, a task has been given from the very beginning, to maintain this world. That organisation which ensures the purity of the seawater and the purity of the air during the many millions of years, is called life. When one admires the order, the equilibrium of the forces of nature which have for their task the upkeep of the conditions of life for so many millions and millions of animals which are so different in their organisation, in their instincts, and in the need of food and of propagation, the land appears as a great system which is terribly complicated, and which has been made to provide for the existence and for the prosperity of its inhabitants. This is true. Who enjoys all the fruits? If there is one who enjoys, it is the society that must work for that family, and for that society. So it is in this other world. Animals, for millions of years had nothing to do but to work for the restoration and upkeep of this great home of living beings, all co-operating according to each one's nature and according to each one's strength to the advantage of the great society to which they all belong. Besides, there is no phenomenon of nature which is not tied by a system of mutual dependence with the whole of the universe. If the animals are considered, not individually as has been done upto now, but as forming a great system in relation with the universe, they can be considered as an abstract system of forces which are applied to the development of the globe, as a further element, as another

atmosphere which surrounds the globe in which are combined all the interesting phenomena of this earth. In this other consideration only the purpose of creation of the animal world can be revealed. All animals in all periods, although disposed upon the different tasks, and with different organical perfection, although they are moved by different instincts which are sometimes opposed, although they are stimulated by different needs and are capable of different functions nevertheless, represent order, as a great society, disciplined, warlike, and brought upon the field as a great army which fights for the upkeep of the other beings in the universe[1]."

These ideas that permeate science today show us the modern trends taken by science. This fascinating subject which rouses the interest and enthusiasm of the child, ought to enter not only into the theory of the school, but also into the practice. The question of cosmic theory is a very wide one. As we follow this direction in our method of imparting instruction, it becomes necessary to have some idea of it.

The idea which gives a different orientation to our old views is that all living beings are not in the world to enjoy themselves. In the past, animals were studied for themselves — their forms, their means of self-defence, and their physiological functions. We must now seek in the functions of animals, their contribution as a species to general welfare and upkeep. They are beings who work not for their own good but for the universal good.

This is an appealing idea for the child, well suited to his mentality, that there is a fraternity among the animals, and that all of them live together in accord with one another, can be transformed into an interesting drama, and enacted with each child representing an animal — the tigers, the mice and the cows living together in beautiful peace. While they were all together in this beautiful way, all of a sudden,

---

1. Here Dr. Montessori quotes an Italian geologist whom she says, was so famous that statues were erected to him in Italy. It is not clear whom she meant.

the beaver said — " I must go to the water ! " Another animal said — " What are you going to do in the water ? How can water attract you? The beauty of the life is upon the tree top. You must climb the trees! " Yet another animal said — " You do not know what you are talking about ! Real life is in the burrows underground. I bury myself when I find a hole ! " Another one said — " Water, trees, burrows ? None of you know what life is ! Running is life ! I cannot stand still. I must run and cover all the space with my legs." Thus each animal talks of it special function, each one attracted by a force bigger than itself. Finally one goes to the water, the other to burrow, another to climb the trees, and the fourth to jump and skip.

There is something stronger, something bigger, than that which comes from reasoning, logic, sentiment or pleasure. Each being goes where it is called, where a mysterious strength calls it, to perform a special task. It is not from the meeting of animals who are friendly and united that the ordering of the world can come. It comes in fact, through an impelling force, which no being can resist and of which perhaps, the being is unconscious. None of the animals in the drama realised, that the call which they felt, which they could not resist, made them carry out a task beyond their understanding, which was necessary for the upkeep of nature. It was the task of creation itself. Interestingly, their response to this call renders them useful to all the others. Our gratitude towards these animals would begin therefore when they start to carry out this task of creation. Thus human beings are roused in admiration of that harmony, and that beauty of nature which provides for all.

Yet nature which is made of the innumerable quantities of different beings that have found a steady equilibrium in themselves, as they form the world, is so full of mysteries. Is nature always evolving ? We must consider the idea that *evolution* is not a successive transformation which comes about with the passing of time, and that it is not the evolution only of life, but of the whole. Nature is in equilibrium, and always remains so. Yet it must make great progress.

The earth, marvellous as it is, cannot remain so. It must be further transformed and undergo further evolution. This enormous and marvellous transformation is brought about by an energy, entirely different from all the other energies so far seen. This energy takes a form which functions similar to animal life — man. This new energy, connects to world progress. Here, for the first time, intelligence comes forth. Animals, although they perform intelligent actions, are not intelligent themselves. Thus, intelligent reasoning and planning comes forth for the first time, in this new being called man. There is so much to be done. Now man, endowed with intelligence and working hands, comes forth saying — " Here I am with my great intelligence! Here is an instrument, my hand, with which I can do the great work of transformation in front of me !" However, this new energy is also propelled by the same irresistable force to perform its cosmic task. Certainly man does not come to the earth merely to eat and enjoy himself ! Like all the other forms of life, he comes with his hands, to do his work. He must nourish himself, reproduce his kind, and find the best living conditions for himself and his family. This then, is the propelling force, behind the conservation of the species and the conservation of the individual, in all forms of life — hunger and love. There is a force which says — " Go on ! Live by eating. Procure the best conditions of life suitable to you — or die ! " This motor pushes forward the work of mankind just as it does all other forms of animal life.

Man works with enormous effort to enable an enormous adaptation. He is intelligent, and sensitive, and can foresee danger. So, he suffers greatly, more than the other forms of life. He is intelligent, and yet unconscious of his real task. So he must feel the darkness of the fatigue and the mystery more than the other animals do. After all, being intelligent and not understanding, is more fatiguing than not understanding at all !

What do men do in this world ? Certainly the task of man is extraordinary ! Man often imagines himself as something he is not. He does not have the instinct for the conservation of the individual and of the species, unlike some lower animals. However, he has other instincts which we must study today.

A deep seated urge in the very soul of man is to associate with other men. Man comes into the world and develops, not as an individual, but as a member of a group.

There is an irrestible impulse in man for migration. It is upon this impulse that the scientific study of modern history, is based. We may say man has a tendency to occupy the whole of the earth, no matter what the conditions of the land — sun or ice. No obstacle can stop him. If there is an ocean, he crosses it. If there is space, he makes use of the atmosphere to travel. He shares this mysterious urge to occupy the whole of the earth with the animals and plants. Animals and plants, by their own force, are limited in their invasion of the rest of the earth. They are brought to other parts of the world by man. Man when he goes to a new land, takes with him familiar animals and plants, and makes the surface of the earth more perfect. In this sense he begins to master the forces of the earth.

This tendency for migration strangely accompanies the tendency man has to fix his abode in a certain place. If we had an aerial view of the earth, we would see pock marks upon it which are the habitations of men. Man takes root, and fixes himself upon every part of the land.

Man also has the tendency to use absolutely everything that is upon the land. He even goes beneath it! He must transform the earth and till the soil — a work of adjustment of the surface of the earth.

This invasion of the earth by man, this occupation and the utilisation of all things apparent, hidden, and even invisible, shows that he represents a bigger and a higher level in nature. We analyse this continuously today, when we study history and geography. We see for instance, how man has transformed plants, how he has moved them from one country into another, how he has transformed animals developing better breeds of them. Thus man works as an energy which modifies the whole earth. Perhaps a day will soon come, when man will be able to dominate exterior forces and call them upon the land. To what purpose? We do not know.

Man has a mysterious guide which we call religion. Perhaps the kingdom of the spirit will soon be established! This is because in each group of people that we consider, we see a tendency towards spiritual life. When man works with spiritual energies, he evolves, and transforms himself.

We are apt to say that the work done by animals and plants is natural, while the work done by man is artificial, and extraneous to nature. We thus speak of civilisation as artificial, and in our discussion insist that man is getting away from nature, that he must return to it.

Nature was very beautiful, as long as there were only animals. When once man appeared, it was no longer sufficient, no longer beautiful. Man cannot go back to nature. He is not made to live that which we call natural life. Man is an energy set above nature. He dominates nature, and transforms it by utilising it. He must make use of all that there is in nature, its energies, all the things that are in and around the earth, to make something above nature, superior to it, but which is nature itself. Instead of of the vague term civilisation, we call it Supra Nature, the creation which is above nature. Thus, man put a new rung in the ladder of creation.

That which we call civilisation is that construction made by man by his effort in invading the whole of the earth, by the work of generations to uplift mankind. In elevating himself from nature, man goes far away from it. However Supra Nature is built on nature. Therefore man is in continuous contact with nature, but this contact is that of the dominator of nature who uses everything in it. Thus Supra Nature grows by feeding on Nature, making use of everything, all the things on the land, even all the energies in the atmosphere. Thus a civilised environment is another form of nature.

If we look for instance, at the beautiful palaces and temples that men have built all over the world, we see that they are nothing but pieces of calcium carbonate put together and built by man. If we look at the work of shell fish, it also takes calcium carbonate and makes a magnificient shell building, elaborate in structure and varied in colours. If we were molluscs, we would go to visit and admire some of this architecture! If we call the building of the shell fish nature, if we call the construction of the bees, nature, why should we call the construction of man artificial? Why should not that also form part of nature? These buildings and temples are but the shells of the beings that inhabit the land, who have created a Supra Nature. The calcium carbonate we use, created and elaborated by the animals, forms part of nature. We take that which has been created in nature, and make a supra-construction with the aid of our intelligence, and by the use of our hands.

All the complicated constructions have been built for the welfare of mankind, to make his life more easy. However if we look at it from an another point of view, these are but marvellous elaborations of nature. Man has such a short life, he dies quickly. What does he want with these things? Why does he anxiously say — " I want to make my *city* beautiful! I want to build magnificent buildings !" Certainly, there is an impulse, the greatest impulse !

All the work that man does continuously, fatiguing himself beyond necessity, is for his own good, but its ultimate aim is a help to nature.

There are millions of men who are continuously doubled above the ground, who dig and plough the earth so that it can produce more. They work tirelessly around the plants in order to eat, but do not eat what they produce.

Miners[1] go deep under the earth, for miles, and miles in order to extract coal from the depths. They gather the coal every day of their lives, buried alive without sunlight, in danger every minute. What do they do with this coal? It is used by everyone in the world for warmth, and to push machines. Certainly the men who extract it do not know those that will make use of this coal. Certainly they will not receive a word of thank for it ! No one thinks about them, yet their powerful works is for the welfare of the whole universe.

Shepherds pass days, weeks, sometimes months, completely alone on a mountain in order to watch animals whose skin is covered by wool. They are servants of the animals ! They serve these beasts for the sake of their wool. Do they take this wool for themselves? They send it up to the places where the weather is cold, so that people can make warm blankets and clothing.

---

1. Large deposits of coal and iron ore helped make the United Kingdom the first industrial nation in the world. The earliest British factories were located near the coal fields, as thc machinery was run on coal. Miners like other workers of the mid 1800s faced great hardships, poverty, poor health, exploitation and terrible working conditions with no safety precautions. Things improved with the turn of the century as a result of extensive reform and the rise of Trade Unions. Today, given the highest safety standards, underground mining continues to be a hazardous occupation and miners may be injured or killed by cave-ins, falling rocks, accidental explosions or poisonous gases.

Fishermen, start early in the morning, at three or four o'clock, and spend the whole day on the sea, exposed to many great dangers. Their boats are fragile little ones. When they catch the fish, do they eat it? They distribute it to the people who wait on the shore to sell it to people who wait in the city to buy it for their use. Each fisherman gives his life for his work. The rice which we eat, has cost the work of several people, who have spent a great deal of time so that we can eat it. Whatever we eat — someone has worked for us, not only in producing it but also in bringing it to our houses.

While the work of man goes on, many things that did not exist in nature are built up in Supra Nature. Man works very strenuously, not for himself, but for the whole universe, for the service of other men. In doing this, he follows the same law seen in nature.

Thus we are faced with two ideas. Civilisation is a construction above nature, which forms a part of creation. Man works apparently for himself, but in reality for others. In working for others, he creates an environment which is not nature, but above it.

Generally when we consider the dealings among men, we do not consider the great phenomenon of unity, a sentiment of generosity which underlies all dealings. Is it nature that has given us all that we possess? Did nature give us the lamp? Did nature give us cloth? Did nature give us this table? Do we find the mats on which we sit growing like rice? Did the roof under which we sit fall from the sky? Our jewels, our clothes! Did we find them growing like fruits on the trees? When we eat, do we pick our food as animals do? All that we take, we take not from nature, but from the hands of other men. The more closely we observe it, the more complicated city life becomes. To have a bath, to drink a glass of water, we must depend on another person, directly or indirectly. An enormous amount of work is done in order to make canals and tubes, so that the water that we drink may reach us. Even if we eat fruit, we do not pick it from the tree, but accept it from the hands of a fruit seller! It is not nature which allows us to live, but Supra Nature. All that we have, we owe to other men.

We should be conscious of this, and be grateful for everything that is given to us. When we eat, we thank nature for giving us food. We should also feel thankful to man. This is not going against religion. If nature depends upon God, so too does man depend upon God. All the things which we have, are made by someone for us whom we cannot thank, even if we want to. So we depend on Supra Nature, in an absolute fahion. All we have and all we use comes to us through the effort and fatigue of many hundreds of people whom we do not know. All men are continuously working for others. We must raise our consciousness and recognise that we live because other human beings allow us to live. This idea must also be made clear to the child[1]. This is a phenomenon of unity among men.

1. Dr. Montessori in the original manuscript describes an incident in a school in Holland. A child asked for a paper to write on. He was taken to the stationery shop to buy it. Then gradually step by step he was helped to trace the story of paper to its source.

CHAPTER 38

What must we do with the child at first when we start? What must we do if he is not interested in anything? What must we do, if the child, instead of doing one thing does another? These questions have been asked for the last fifty-five years. They will be asked for many years to come. I could say in reply — " I will come with you, and show you how to deal with the child." We may consider that a great help. However, it would only be a great hinderance. If I were to give one of our teachers such help, she would watch what I did with the child, as though I had a magic wand by which all problems could be solved. She herself would not do anything. If I gave her advice, she would say — " Oh, this is what I must do ! " She would then begin to apply it to all the children, in all the situations. The difficulty will thus be multiplied and made permanent.

We must recognise that there is an initial difficulty. There have been certain teachers who have tried their best for years, and have become depressed. There are other teachers who after just a few days of going round the class say — " It has come ! The children work of their own accord, and we have done nothing to perfect them. " One of our teachers wrote a letter from Holland with this very interesting fact — " I am now very interested in the children themselves, to see all that they do. It is curious that these children have noticed this change in me, that I am more interested in them than I was before. Suddenly, they do everything that I ask them to do when before they never obeyed ".

Once I advised teachers that we could call the attention of the children, by means of collective lessons, some exercise in which their movements are brought into play. It could be a preparation. If we tell a story which rouses their interest, we may begin to grasp their attention. It is then more likely, that their attention may become fixed upon some extraordinary object. This advice is not very useful. It is a very artificial way of calling the attention of the children. Yet I offer this advice to those who wish to start one of our schools. One of these teachers, an attentive pupil took down every word of what I said. She wrote a letter to me when she began to work with a group of children in France. The letter reads — " It is marvellous to see how these children work. They work by themselves, and they are occupied the whole morning. The only thing at which that I do not succeed is in interesting them in a collective lesson. I call them, but they do not come ". How difficult it is to give advice! How erroneous it can be! This teacher has religiously taken it into her head that she ought to give the children a collective lesson. However the children are working by themselves, and she has to take them away from their individual work in order to give a collective lesson!

Once we told a teacher — " Do not give all the material on the first day itself. It will bring confusion into the mind of the child. Wait a while before presenting the material and observe what happens to the child, after you have presented the material. " This advice was taken too literally. When we went to see the school after a month or two, there was nothing in the school, no material, no work for the children. When we asked why she had not given the materials to the child, the teacher thought we were contradicting ourselves!

Yes, there are certain difficulties in the beginning. We adults have certain obstacles in our spirit. Also the children may have acquired a certain number of difficulties. The consolation is that we must reach the point of departure, arriving at that final point when the child concentrates with interest, upon an action done with an external object. Only after this final point has been reached, can we really offer the teacher a guide, as precise and as exact, as the one about the physical part of the school. When we say that the teacher must leave the children free, and that she must slowly and gradually become a passive being, we refer ony to those teachers who deal with children who have reached this final point, normalised children. Initially we might say, the whole thing is left to the teacher's common sense, and ability. Any further advice, will only cause disaster.

We must repeat here once again that which we have already said—" Do not interfere too much. " When I give this advice, often teachers have understood me to mean that we should not interfere with the child. We can apply this to the teacher. A teacher should have a general idea of what is to be done and how. However in going to help a teacher we may begin to interfere too much, and say — " That is not the way do to it " ! After a little while, the poor teacher will become completely paralysed, able to do absolutely nothing. Instead, by doing her work in her own way, and learning from her own experiences, a vision will come to her. When she grasps this vision she becomes a triumphant teacher.

The child, who is not normally developed, who has not got an inner guide, whose mind wanders here and there, is like a piece of crushed and wrinkled paper. The folds are the defects of the child's mind. He may be a glutton and like to eat too many sweet things. He may like to take everything that he sees around. These defects of moral construction, are sometimes in contrast and sometimes associated with one another. Now, that is what is demonstrated with the piece of paper. The child, crushed like the paper, must become straight. Something must iron him out, until all his defects disappear. The teacher should expect that the child, after he has been in the school for a certain amount of time, will undergo a change, and acquire characteristics which would be of great help to her in her task.

Some well known professors of a University in France, carried out research upon the nerves, and the psychological defects of men. The tendency in modern times, is to measure everything. In the course of these studies, they discovered through statistics, that those who had certain psychological deviations, also had an irregular heart, and non-rhythmic breathing. Then one who studied normal people, gathered staticstics to see if they too had these physical defects. How difficult it is to find perfection ! Most people did have some kind of defect, an irregular heart and non-rhythmic breathing ! It was also found that if the conditions of life of these individuals were improved, (if they lived in a sanatorium for instance) these defects disappeared. Thus a regular and ordered life can bring about the rule of something superior over something inferior. This is not dependent upon the will. We could not make the heart stop, even if we wanted to. So it does not depend upon the will of anyone else. When we become the master of ourselves, we see the psychic dominion of the ego upon the submitting function. If the psychic ego is absent, if we cannot master ourselves, the other functions, the servants of the phychic ego, do whatever they like, and all these defects appear. We usually study these defects one by one, and not collectively. So, earlier doctors confronted with this problem, did not take into consideration the absence of a superior ego. They singled out two kinds of complaints, a psychological irritation, or an irregular heart, and tried to cure each defect singly, one treatment for the heart and another for the nerves. However, these professors in France, had the intuition that these defects could not be cured singly, but that the cure lay in dominating the ego. So the professors and statisticians of the University, came to India where they had heard there were yogis, who had won dominion over the ego, and therefore themselves, to measure their hearts. When they did so, they found perfect normality — no irregular hearts or non-rhythmic breathing. Everything functioned normally. The professors concluded that the domination of the ego and the will respectively,make all the inferior parts of physiological vegetative life, and all the superior psychological parts, function to perfection. However it would be difficult to make every individual in the world, a yogi !

We have seen this phenomenon in children. It is just this upon which everything is based. This phenomenon is easy to achieve in childhood. It is easy to bring back order in children. Interest is a superior part of a child's personality. It powerfully dominates the child. A child who has acquired this interest, begins to function, as though a superior power diects the dependent functions. We cannot cure the single defect. We must hope and wait for this mastery of the child over himself, so that he may dominate himself. It is the tendency of childhood to become strongly interested in some action. This interest, and concentration is not dependent merely on movement. With the Long Rods, for instance he has the opportunity of moving his hands. Yet other faculties come into play. He may be interested in recognising the different levels in the rods. This has nothing to do with the movement of the hands.

The teacher must help the child. The more exact the things she gives the child, the more interest the child has in the environment around him. We cannot exactly describe what happens. However it can be compared with the phenomenon of crystalisation. When a child becomes interested in something, the other children around him also seem to acquire an interest in it. So she must prepare an environment which rouses the interest of the child. When she sees a child going towards something in which he is interested, she must recognise the symptoms, and must not interrupt this action. This is also true for the teacher. Her interest must be aroused. Only if she is interested will she observe the child. The teacher must also be prepared. She must feel confident. She must have faith in the phenomenon of normalisation. When she has this love, this faith, she becomes more sensible, more capable of feeling, more capable of recognising the child's true nature, and more capable of handling the child. The calm in her behaviour is not the calm of the yogi, but the calm of a person who is active, who helps[1].

The Exercises of Practical Life often serve to remedy psychological deviations in children. However, this must not be taken in an absolute fashion. If we use our common sense, given to us by experience, we must try to understand, that we cannot limit the children to these simple exercises for a long time. These exercises which help the child to become normalised, to fix his attention, to arouse his interest, will make the child deviated if prolonged. So when we see a child who can do other exercises, it is time to go on, even if there is only one child who can do it. It is not necessary that we should wait till all the children are ready.

The great wave of interest in our schools and their great success is due to the fact, that in spite of all the prejudices and criticism, we opened the communications between the classes of the older children and that of younger children, keeping the doors between the classes open. The younger children become interested in what the older children do, and carry out the work much more quickly, doing lessons thought to be beyond their capabilities. This showed us

---

1. Dr. Montessori clarifies what she means by help in the original manuscript. Offering the child an object all the time may not be help.

that things we thought very complicated for children of seven years, were interesting to children of just four years, such as the working of the decimal system. This is why we call our school, a House of Children. They are not schools, not prisons, but open houses. The children go freely from one room to another. The teacher must know that something will happen, that the child is bound to become interested in something. She is in a much easier position than the teacher who worries constantly about what to do with each child, which child should be given which material at which age and also worries about all the things which the child is not doing. Such a teacher is always agitated. She is always thinking about what she wishes to do, what she must do. If instead, she would think of the child and not of herself, she could admiringly wait for something to happen.

If the child has found normalisation, a possibility of going on with some work, we must give him the material. The material is one treasure at our disposal. We have another treasure in the child. We see him carrying out simple, practical actions, and becoming calm. When we give this material to the child, and he becomes interested in working with an external object, all his defects will disappear. We must look at this with interest.

In traditional schools, the teacher has the syllabus to back her up. She is armed with power. She can pnish and distribute prizes. She has the law behind her. She suppresses the children with the knowledge that she has.

In our schools, the teacher has not got this arm, which can kill the whole of humanity, spiritually and intellectually. She is not a machine which follows a certain syllabus, which has certain lessons to recite to the child, and to make him recite them back. She is a sensitive human being who works with her intellect, and loves her work. She is not helpless. She has faith in human nature and the child. She is calm and sure of herself, but not timid. She is not frightened or nervous or in doubt. She is armed with love and understanding.

A deviated child feels free to do anything he likes, as soon as he realises that the teacher is not sure of herself. With this timid and oscillating teacher, all the defects of the children remain. The deviations augment and multiply. They do not disappear.

There was once in Barcelona, a man who was frightened of children, as frightened as he would be of poisonous snakes. He was a new teacher, (not one of our teachers) and he came to teach the children music. The school was one in which the children could do anything they pleased. In this environment, he felt very timid. However the children were only four and a half years old, so he started to play thinking that they would not understand any of it. Their opinion would not matter, as would the opinion of a teacher of music. When the children heard the teacher play a tune, they began to skip and jump, and frolic about. After a while, pandemonium broke out. The children shrieked boisterously. When the teacher looked up, he was completely frightened and ran out crying — "Help me, I do not know what to do with them." After a few lessons, the teacher saw someting true in the children. He became interested in them and wanted to find out how much the children could understand. He became interested in seeing a change in the children. There were also changes in the teacher. Gradually, a communication between the teacher and children was established. This teacher became as interested in the children as the children themselves became interested in an external object upon which they could concentrate.

When there is communication, two personalities merge as one, and respond to one another. This represents a wonderful phenomenon of order which is brought into the inner personality of the child. This order cannot be born within a small child unless there is activity and work. There is no other way of helping the child. Persuasion and speech will only make the child feel more miserable. The only way is to allow him to express himself through his work. The man who thinks and works with his hands, enters into the deepest characteristics of human society. So the child who thus expresses himself through action, is a part of Supra Nature. If we look at the history of humanity, we see that it is man who thinks, and man who creates. It is marvellous to see that this germ exists in the soul of the child, as the expression of normality. We may find men who did not think, men who did not work with their hands. Those are adult beings. If the child is given the chance, he will express human normality working simultaneously with his head and his hands. The child seeks activity with his hands, directed by his mind. When he finds an inner interest, he becomes normal. It is then that the child experiences happiness. His expression changes, his face changes. He enters into his own centre. This then is the task of man — to think and to work. Thus the child enters into the cosmic order.

The central point to be reached is very clear to the teacher — to arouse the interest of the child, and to help him to concentrate upon an external object. This is a great help. If she had many different things to do, and many different ends to reach, it would be very difficult. She has only one aim, the end itself is so clear, that it is not possible for her to say — " It is not possible for me to recognise it ! " She must make this idea a part of her consciousness, a part of her personality.

However she must also use her common sense. From one day to another, the personality of the child cannot miraculously change. When the child has become interested in one action, or when he concentrates upon one object, he may not instantly, from that very moment become deeply interested in everything around him. Indeed this is not to be expected. Very often, the child becomes interested in something he does, in some special action, and then suddenly he ceases to work and does not interest himself in anything. The teacher gets discouraged and says — " He is no longer interested! Will he work again ? Will he become interested again ? " There is nothing to get discouraged about ! The arousing of the child's interest, and getting his attention fixed on an internal object has been initiated. This in itself is already a great achievement !

When the child begins to walk, he may actually take a step, but because he has no equilibrium he cannot take another step without falling. Yet the fact remains, that he can stand and keep his equilibrium. If the mother was to reason like the teacher she would say — " Oh, my son, I thought he was finally going to be a man when he took that step ! After one step he keeps falling down. What a terrible thing! My poor child, he will never be able to walk ! He will never become a man ! " Something has happened. The child has taken a step. Certainly no mother with a child at that stage, asks — " Do you know what I must do to make my child walk ? He started to walk. He even took a step ! Now, he does not walk any more ! " She extends her arms to the child as an encouragement for him to come her. She holds the hand of the child while he tries to take his next step. If he falls, she makes light of it laughingly, so that the child may not feel powerless or inferior. She pushes the child with love and encouragement. We are accustomed to seeing things happen on the physiological side of life. We know that once the child begins to walk, he has a tendency to grow and develop. We have had the chance to be near the physically normal being.

On the psychological side, the teacher must wait for the growth of the interest and enthusiasm to appear again, with the certainty that he will take the next step. She can only take the care which the mother takes when the child has taken his first step. When he has made this first conquest, when the teacher has rejoiced at the conquest made, she must surround the child with care and encourage him to continue his actions along the lines of this conquest.

When the interest of the child has been initiated, the teacher must also be able to understand this phenomenon. It is a great event, a first step. The joy, interest and care, that the teacher bestows is a great help for the soul of the child. She does not merely extend her arms to the child or say nice encouraging words to him. She has at her disposal scientific material which has been graded carefully. She also has an exact scientific technique by which she can proceed. By presenting this material to the child by means of an exact technique, at the appropriate age, she helps the child most efficiently, to achieve success. After seeking the permission of the child, she must clear the table of all other objects, and present the material in a clear and inviting fashion. If the child does not show interest in what she presents, what can she do ? She can do absolutely nothing. The only important thing in such a case is not to frighten the child. She can take the material away, and perhaps present it the next day, the next week or even the next month, whenever her common sense tells her it is time. However from that moment in which the child for the first time becomes interested in something, the teacher, must change her character. From the moment when his eager interest has been awakened, from the moment she notices something in the child, she should never cease to remember that in the child a process has begun, an effort which will bring him to a constructive action. Every time there is success, every time that there is triumph in the effort of the child, the spiritual communication between the child and the teacher becomes stronger.

The child in a successive process concentrates upon some work, and gradually becomes more open and acquires more and more confidence in himself. He becomes conscious of his own value. This self-evaluation is the most important thing. The teacher is persuaded that such a phenomenon takes place, and that it goes on happening. If the teacher shares the prejudices of adults in general, that she should correct the errors of the child, that the child should learns his lessons within special limits of time, then she herself becomes an obstacle to the development of the child. The traditional teachers, look at the child and say — "The child has done this. However he has made an error. What shall we do to correct the error ?" The preoccupation with the infinite details may worry the teacher, and lower her self-confidence. What does it matter, if the cubes of the Pink Tower are placed in order or not? What does it matter if the child does not succeed in putting the cylinders in the proper place if he tried to do so? So long as the child has used the material well, does it matter if he commits an error? At the moment, this is of no importance to the child. The teacher should be free from this preoccupation.

In our advice to teachers, we do say that the material is made in such a fashion that it has the control of error. We insist on all the precautions taken to prepare it so that the child will not make any error. Now, we also say, it does not matter if the child does make an error! This only appears to be a contradiction. The important thing to develop in the child is his courage. The aim of the activity enabled by the material, is to give him the opportunity to express his action frankly and spontaneously, with courage. Even if he has made an error, the child has the illusion that he has done right, so that after the work, he may feel, the uplift and consolation of saying — "I have made this effort ! I have succeeded." What is important is not to take a second step, but the effort that is made to walk ! The teacher should help the child in the psychic field to make the effort. Her preoccupation, must not be with the errors that the child commits, but to encourage the child to do it again and again in order to bring him to perfection. If this courage is given to the child, he will repeat the exercise again and again, becoming more and more perfect, eliminating all the errors that he committed in the beginning. This is why the material is so exact ! This is why the technique is so exact ! This is also why the material has the control of error ! If the teacher sees an error committed by a child she may say — " You have done it wrong ! " The child may listen to her corrections, and take it in. However he will just simply leave the material and never look at it again, perhaps for a whole week, or even a whole month.

When we learn gymnastics, we try with all our muscles to overcome certain difficulties of movement the body require for perfect gymnastics,. When we are putting all our effort into it, a teacher says — " No, no this is not the way to do it ! " She shows us the perfect way of doing the exercise. We cannot do it, and say so. We become discouraged, and it stops us from ever trying it again.

Therefore, the teacher must obey two rules. She must not interrupt a child who is working. She must not correct indiscriminately the errors of the child. Only if she follows these two golden rules, can she build courage and self-confidence in childhood.

However how can a teacher deal with the errors? If the child has committed an error in doing some exercise, she should do nothing at once. She merely accepts the child's accomplishment of the action with the materials. When this impression has passed, when the constructive process inside the child is over, perhaps the following week, the teacher, can with a little effort offer the same material, the same lesson given on a previous occasion with the same exact technique. Perhaps the child will understand this time, what he had not understood before. The preoccupation of the teacher must not be with the error which the child has committed. The child may not need the correction by another lesson. Perhaps he will watch other children working and correct himself. Teachers are beings who have in their hands, the values of other humans beings. She helps them, as in a game of chess, by moving one piece here, and another piece there. These values under her hand acquire greater and greater values. We can say in reality, that if she succeeds in this, she has succeeded indeed ! She thus wins the game of life.

The teacher when she commits errors herself must apply the same reasoning that we applied to the children. As one who starts to walk upon a new field, she falls more often than she is able to walk. However, she must never lose courage or faith in herself. When she makes an error, she must correct herself, and start all over again. Thus there are two beings who seek perfection, who now value themselves more highly — the child and the teacher. The teacher might feel — " We need a guide. I cannot begin by being perfect. I do not even know how to begin ! " Even when she is right, someone may tell her that she is wrong. So the teacher may have doubts — " Have I done well ? Have I done wrong ? Is this the way to do the exercise ? Should I start this activity at this stage ? "

The teacher has a guide in this very doubt. She also has a control of error. If the child becomes interested in actions which are more and more difficult from the intellectual point of view, and at the same time retains his beautiful confidence in himself, if this confidence grows and augments itself, the teacher has done well, and committed no error. If this does not happen, she has made a mistake somewhere. How can she remedy the mistake ? She must take a spiritaul mirror, and look for her defects, discover them and correct them. She may be in a temper, or preoccupied with something else while giving the details of a lesson to a child. Although she tries to hide them carefully, these hidden defects are like flashes of fire which will flame up and make the children into beings that she does not want them to be. There are two main errors into which teachers fall. One is to interfere with the child who is really occupied with something, and interrupting the activity of the child. The other is to abandon the child. When the child has finished an activity, when he has completed a constructive process, he is in need of something to continue with it. If the teacher has nothing to give him, he finds himself abandoned.

In ancient Rome, there were certain priestesses called the Vestals[1] whose task was to keep alive the sacred fire, and to see that it never become extinct. There were two ways in which this fire could be put out, by some deliberate action, or by an oversight, for instance like forgetting to put in the fuel. If the Vestals allowed the fire to be extinguished, their lives also went out. They were condemned to death !

This is our mission — to keep alive this fire in the child who has been given into our care. We must mount guard against the two dangers which may put out the fire in the soul of the child. We may put it out, ourselves being the obstacles in the path of the child, interrupting and interfering voluntarily. We may put it out without knowing through negligence, by not offering a material when the child is ready for it. Thus by our negligence to give food to this flame within the child, the child's interest dies, and the fire goes

---

1. *Vesta*, was the goddess of the home and family in Roman mythology. The hearth was the centre of the family, in Roman mythology and Vesta's symbol was a fire in the hearth. In a temple honouring Vesta in Rome, burned a permanent sacred flame tended by six priestesses representing daughters of the royal house. Chosen between the ages of five and ten they served for thirty years, during which time they had to remain virgins. The Vestal Virgins were punished with a severe beating if they did not carry out their duties. However it was the violation of their vow of chastity that led to death by being buried alive. In the original manuscript. Dr. Montessori apologises for any inaccuracy in her extension of the simile, pleading a faulty memory. She also apologises for her choice of the simile more appropriate in her own country than India.

out. *If* we *commit* these errors as new teachers who are trying to bring something new and better into the teaching world, we are finished. We do not exist. We become discouraged and rebellious and say — "The child must and shall learn something!" We force him to learn, going back to the traditional method. The teacher, the missionary, the prophet, is not there. Who has killed that spirit? It is the teacher. The judgement is severe, but it is self-administered.

If we pass through these great trials of the Vestals and are alive, with the fire burning merrily, the children learn a great deal. The defects that they had when they first entered our schools disappear. Physical and psychical ailments disappear.

Most adults are glad when the child's defects disappear. To them the child was a vase full of defects. What then is education? Education is to them, a way to take away defects.

This is not our idea. The defects are not important. What is important is the strength of the child, the forces hidden in the child which are revealed and now have a chance to develop. From this step, the last rung of the ladder, the directive endeavour and guide we must follow must be the development of the child's power. This is the last chapter, the last step, the triumphant goal which represents the new force and the new strength of humanity, which represents our triumph as educators.

EPILOGUE

I feel with sorrow that the course is nearing its end. I can quite understand your pleasure and your gladness in its coming to a finish because you are going back to your homes after a brief passage of sadness at examination time. I am sad not only for the fact that I shall have to leave, but because I have not done what I wanted to do. Here I am at the end of my course and still we might say, we have to talk about everything ! So the end of this course looks like the end of a fold of a book which has yet to be read. Certainly there are things we have learnt — the way to treat children, the way of presenting the material — in other words, the method. I have received many questions for further explanations about the method. I feel that too many of them are questions that I have already answered in my lectures. We might go on questioning for another three months or even for another three years !

There are some of you who are interested in one thing and others in other subjects. I should like to give all of you an idea of the whole method which may be useful not only for the elementary schools, but also for middle schools, high schools and universities. I am certain that when I tell you these things you will feel that you have heard them before. If you find something useful, take it. There is a free choice. You can choose and take things which are of interest to you and leave the rest to me.

Index