

north wall, the distance being accurately measured with a tape, the error of which was found by comparison with the standard yard preserved in the Observatory.

The cistern was filled with three-fourths of a gallon of glycerine, coloured red by aniline, first heated to a temperature of 100° F. to render it more limpid, so as to disengage the air more freely; the plug, E, was then removed, and the air extracted out of the tube by means of an air pump connected at the top of the glass tube, when the pressure of the atmosphere forced the liquid up to a height of 323.571 inches, being equivalent to 30 inches of mercury, the Kew standard at the time reading 30.3 inches. The plug was then screwed in to support the column, air admitted at the top, the air-pump connections removed, and the tube filled up to the top with glycerine, and the india-rubber stopper inserted. The screw plug being removed for a few seconds to allow the column to fall an inch or two, was then replaced, and the instrument left, until the liquid was completely exhausted of air, which slowly rose to the surface, into the vacuum above; the india-rubber stopper was again withdrawn, the tube filled up, the stopper replaced, and the cistern plug finally removed, when the column gradually fell until balanced by the weight of the atmosphere, leaving a small quantity of glycerine in the cup above the stopper, over which a plate-glass cover was placed to keep out the dust.

Daily observations of this instrument are now being regularly taken at Kew Observatory, under the superintendence of Mr. Whipple, the Director, which will decisively prove whether the instrument is to be regarded as one of scientific precision, but in any case the inventor is to be congratulated on having reduced to a simple construction an instrument forming a large scale weather-glass, suitable for ordinary observation, which cannot fail to be of interest and value at our museums and other public institutions.

C. E. R.

THE HISTORY OF WRITING¹

I HAVE promised to speak to you to-night on a large subject, one which, to be treated adequately, would require, not a single lecture or a single hour, but many lectures and many days. The history of writing is in great measure the history of the human mind; just as anything like real abstract thought is impossible without language of some kind, so, too, without writing it is difficult to conceive of a progressive civilisation or a developed culture. The trained memory is no doubt able to accomplish marvellous feats, as we may learn from the Hindus, who have preserved by means of it, through long centuries, not only poems, but even scientific works as well; nevertheless, the memory has a limit, and I think most of us would be sorry to trust to it alone for the record of our own thoughts and discoveries, much less those of others. If language gave man the power of continuous thought, writing has enabled him to develop and make use of it.

There is a striking analogy between the history of language and the history of writing. Both have sprung from a humble origin. Language began with a few sounds and cries which symbolised and expressed an equally small number of ideas; writing began with pictures of such objects as fell within the experience of the first draughtsmen. How early this was in the history of our race has recently been disclosed to us by archaeological research. Like the child, primitive man amused himself by drawing pictures of the things he saw about him, and like precocious children sometimes showed remarkable talent in practising the art. The drawings of reindeer and other animals, scratched by means of rude flint implements on reindeer-horns or mammoth-tusks, which have been found in the caves of France and our own country, are frequently of high merit, and prove that

¹ Lecture at the London Institution, February 12, by Prof. A. H. Sayce.

considerable skill in the art of drawing may coexist with the lowest savagery in other respects. It is a lesson that we might already have learnt from the Eskimo, whose etchings on whalebone are not unworthy of European artists, or from the Bushmen of Southern Africa, who have long excelled in painting animal forms on the smooth surfaces of rocks. But these contemporaries of the reindeer and the mammoth, who belonged to what is termed the age of polished stone tools, when England and France were still enfolded for six months of the year in a garment of glaciers and solid ice, were not the first in the West who practised the art of drawing. A remarkable discovery, made during the past year in the region of the Pyrenees, has shown that long before then, in the days when the cave-bear and hyæna and other extinct monsters of the old world still existed, and when the geography of Europe differed widely from that of our own time, there were men who employed their leisure in depicting the animals about them as well as themselves. A number of teeth belonging to the cave-bear have been discovered in a cave of the palæolithic or "old-stone" period, adorned with drawings, some of which represent human beings, covered, let it be observed, with long hair like the mammoth. I have sometimes fancied that language itself may have owed its first start and progress to pictorial aid. It is said that two Chinamen, in despair of understanding each other through the help of a language which has to denote so many different ideas by the same sound, have been known to have recourse to writing; and most of us remember when our own efforts to learn to read, and in some cases to increase our acquaintance with our mother-tongue, were assisted by the use of pictures. An appeal to the eye is surer and more impressive than an appeal to the ear, and we recognise objects more readily by their pictures than by their names. After all, therefore, it may not be a paradox to imagine that the beginnings of writing may be older than the beginnings of language, that men drew pictures before they uttered articulate sounds.

However this may be, the development of writing was soon far outstripped by that of language. Language enabled man to create and record *ideas*; the pictures he made were pictures of objects only. Until he could represent to the eye ideas as well as objects, his writing was a very poor affair indeed. It is only by courtesy that it can be called writing at all. But a time came when a great step forward was made. The ideas that had to be supplied when combining the pictures of several objects into a story gradually came to be read into the pictures themselves. A pair of legs, for instance, came to signify not only a man's legs but the idea of walking as well. Writing began to pass out of its infantile stage; to cease to be merely pictorial and to become ideographic.

This is the point at which the development of writing has stopped among some races of men. Thus certain of the North American Indians have long possessed a means of communicating with one another, and of inscribing magical charms and exorcisms on rocks or the bark of trees, by means of pictures and ideographs. When these hieroglyphs, as we may term them, are painted, the system of writing is called Kekinowin, and some of the pictorial symbols employed in it are curious enough. A warrior, for example, is represented by the picture of the sun, with eyes, and nose, and two pendant lines, because he ought to be as bold and strong as the great luminary of day. A hand held upwards with the fingers extended denotes death, and a series of circles one within the other signifies time. This system of writing has been developed to such an extent among the Mikmaks, that a religious work has been published at Vienna entirely written in it, and containing no less than 5,701 different signs.

As soon as writing advances to the ideographic stage, the exact delineation of outward objects naturally ceases to be necessary. When once it has been determined that

a pair of legs should express the idea of walking, the accurate drawing of the legs is no longer a matter of consequence. The two lines of an angle could represent the idea just as effectually as a carefully drawn pair of legs. The memory and intelligence have been appealed to as well as the eye, and we can as easily remember that the idea of walking is denoted by two lines as by two legs. Consequently we shall find that as soon as the ideographic stage of writing is reached, the forms of its symbols begin to degenerate. Just as the sounds of which words are composed are worn away in time by phonetic decay without any necessary impairment of their meaning, so, too, the forms of characters grow changed and modified without injury to their significance. It takes less trouble to represent the human figure by a couple of crossed lines than by an elaborate picture, and if the symbol remains intelligible, the less troublesome representation inevitably supersedes the older one. Pictures pass into ideographs not only as regards their inner sense, but also in their outward form.

The great discovery has thus been made. Ideas can be rendered intelligible to the eye not by calling up pictures of objects but by arbitrarily determining that a particular sign shall stand for a particular idea. The pictures of primitive man have become characters. It is no longer the outward senses but the memory that is appealed to. In short, a system of writing has been invented which can be learned like a language. All that now remains is to perfect the invention, to discover how the whole realm of human ideas can be expressed by the fewest and simplest signs.

But the development and perfecting of the invention was a slow and gradual process. When we look back upon past ages it seems strange to us that the characters were not at once reduced to an alphabet, the letters of which denoted mere sounds. We may ask why it was that men were so long in finding out that it is quite as easy to symbolise sounds as to symbolise what is still more impalpable, namely, ideas. What seems obvious to us, however, was by no means obvious before the knowledge and experience which we inherit was slowly and laboriously acquired. No great discovery is ever made at once, by a leap as it were. It must be prepared for and led up to; the time, as we say, must be ripe for it. And the history of writing is the same as that of all other great discoveries. It was a long time before men began to realise that our system of writing may be intelligible to others even if we do not try to represent ideas at all. As ideas multiplied it was found impossible to find separate characters for each of them, much less to remember them all. At first the difficulty was evaded by combining two or more ideographs together in order to express a new idea, which was analysed into others already known and represented in writing.

Thus the ancient Babylonians had separate characters to denote "water" and "eye;" by combining these they succeeded in suggesting to the mind of the reader the notion of a "tear." So, again, as the sun was symbolised by a circle, a month was readily represented by writing within the circle the numeral thirty, which signified the 30 days of the lunar month.

This mode of expressing ideas may be termed classificatory. Ideas were arranged in classes, one under the other, and just as we define an idea by making it a species of some other or more comprehensive idea, new ideographs were formed by setting two or more side by side, one to denote the genus, the other the species. Thus, as Dr. Legge has shown, "a wife" is represented in the ancient Chinese writing by the two ideographs of "woman" and "broom," the Chinese conception of a careful housewife being that of one who keeps the house clean by constant sweeping. So, too, in the hieroglyphic system out of which the cuneiform characters of Babylonia and Assyria sprang, the ideographs of "great" and "man" stood for

"a king," who was regarded as a special member of the genus "man." The idea of "father," again, was picturesquely expressed as "the maker of the nest," and that of "prison" as "house of darkness."

But after all there was a limit to the number of ideas which could be represented ideographically. As civilisation and culture progressed, pictorial writing found it difficult to keep pace with the new ideas which were being continually called into existence. And even if means were discovered for representing them all, the burden upon the memory became excessive and intolerable, a lifetime was required to learn a system of writing which attempted to denote by separate pictures or groups of pictures the manifold conceptions of civilised life. A civilised people, moreover, is necessarily brought into contact with its neighbours. It may try to shut itself up in silent isolation, like the Egyptians of the Old Empire or the Japanese of a more modern day, but sooner or later the nations which surround it will force themselves upon its attention, if not in the way of peace, at all events by war. Then comes the question, how to express in writing foreign proper names which have no meaning in the language of those who would record them? There is only one answer to the question, only one solution of the difficulty. We must cease trying to represent objects and ideas, and must represent words, that is, sounds instead. The day on which this fact dawned upon the human intelligence was one of the most important in the history of our race. An alphabet became possible, and with it the almost unlimited power of expressing the thoughts and needs of mankind.

But it took some time yet before the possibility was realised. Great discoveries, as I have before said, are not made all at once; simple as they seem when once made, they must be led up to slowly and step by step. An alphabet was preceded by a syllabary, that is, by a system of characters each of which denoted not a single sound but a syllable. It was almost inevitable that it should have been so. We do not naturally divide our words into individual sounds but into syllables, and a syllable often stands for a word. This was especially the case with the languages of the three leading inventors of writing, the Chinese, the Egyptians, and the Accadian population of primitive Chaldea. Many of the ideographs, therefore, used by these nations represented not only ideas but also single syllables, and it was obvious that they might be employed to express both. In Accadian, for instance, the word *bat* signified "to die," and was represented by a picture of a corpse; but *bat* also meant "fortress," and so what was originally the picture of a corpse came to be inserted in the picture of "an enclosure" when the latter was intended to denote a fortress or citadel.

As soon as the fashion had been set of assigning to characters as phonetic values their pronunciation as ideographs, it rapidly spread until every character came to have a purely phonetic value attached to it, as well as an ideographic one. The process was, no doubt, much aided by the decay and decomposition of the old pictures; it was easier to treat a character which had lost its original pictorial form as a mere representative of a syllable than one which still remained a faithful image of some natural object. But the process was attended by one great drawback. Ideographs, as we have seen, might stand for more than one idea, or the same idea might be known under different names; when, therefore, the old system of ideographs was changed into a syllabary, each ideograph represented more than one syllable. The polyphony or power possessed by each character of denoting several phonetic values, which resulted from this, has been a great stumbling-block to the decipherers of the inscriptions of Egypt and Assyria, and has only gradually been removed. It was also a stumbling-block to the Egyptians and Assyrians themselves, and various devices were

adopted for avoiding it. Why it was never determined to take it out of the way altogether by restricting each character to the expression of a single syllable, was probably due to the same cause as that which makes ourselves cling so tenaciously to our own polyphonus alphabet, the innate conservatism, I mean, of the human mind. At any rate, it was left to a later age and to the foreign borrowers of the Assyrian syllabary to make an improvement which seems to us at once so obvious and so necessary. Up to the last, therefore, an Assyrian character could not only be used ideographically, but also as the representative of several distinct and different sounds. Take, for instance, the character which, as we have seen, meant originally a corpse. As the usual word in Accadian for "a corpse" was *bat*, *bat* remained the usual phonetic value of the character, but besides denoting *bat* it also denoted the syllables *til*, *mit*, and *be*, and might be used to express any one of these sounds whenever the writer willed.

In the eighth century before our era, the Assyrian mode of writing was adopted by the tribes which at that time occupied Armenia on the north, and Media on the east, and the first great reform was introduced into it by restricting each character to the expression of a single syllable. In order to express syllables, however, a good many characters were required; by the side of *ba*, for example, it was necessary to have a *bi*, a *be*, and a *bu*, and accordingly, every one who wished to learn to read and write was obliged to have a good memory. It was reserved for the Persians to make the last improvement in the cuneiform system of writing by ingeniously extracting an alphabet out of it. And the way in which they went to work was this. A certain number of characters was taken, their signification as ideographs translated into Persian, and the particular sound with which each of these Persian words began was assigned to the character as its alphabetic value.

What it required the combined labours of several different races and nations to effect in the case of the cuneiform characters of Assyria and Babylonia was effected unaided and alone by the wonderful people of ancient Egypt. The Ashmolean Museum at Oxford contains one of the oldest monuments of civilisation in the world, if indeed it is not the very oldest. This is the lintel-stone of a tomb which formed the last resting-place of an official who lived in the time of King Sent, of the second dynasty, whose date is placed by M. Mariette more than 6,000 years ago. The stone is covered with that delicate and finished sculpture which distinguished the earliest period of Egyptian history, and was immeasurably superior to the stiff and conventional art of the later ages of Egypt which we are accustomed to see in our European museums. But it is also covered with something more precious still than sculpture, with hieroglyphics which show that even at that remote epoch Egyptian writing was a complete and finished art, with long ages of previous development lying behind it. The hieroglyphic characters are already used not only pictorially and ideographically, but also to express syllables and alphabetic letters, the name of the king, for instance, being spelled alphabetically. In the hands of the Egyptian scribes, however, Egyptian writing never made any further progress. With the fall of what is called the Old Empire (about B.C. 3500) the freshness and expansive force of the people passed away. Egyptian life and thought became fossilised, and through the long series of centuries that followed, Egypt resembled one of its own mummies, faithfully preserving the form and features of a past age and of a life which had ceased to beat in its veins. Until the introduction of Christianity the only change undergone by Egyptian writing was the invention of a running-hand, which in its earlier and simpler form is called hieratic, and in its later form demotic.

But what the Egyptians themselves failed to do was

done by a body of enterprising and inquisitive strangers. For some centuries after the fall of the Old Empire Egypt was given over to decay and intestine troubles, and when it again emerges into the light of history it is under the princes of hundred-gated Thebes in the period known as that of the Middle Empire. It was while these princes were adorning Thebes with temples and granite colossi, and excavating tombs for themselves in the rocks of Beni-Hassan, that a small party of immigrants, only thirty-seven in all, arrived in the Delta about 2,700 years before the Christian era. They were shepherds and cowherds from the coast of Phœnicia or Palestine, and as it were with an instinctive realisation of the great part their kinsfolk were afterwards to play in the history of Egypt, their arrival was commemorated in painting and hieroglyphics on the walls of one of the tombs at Beni-Hassan. There we may still see them portrayed in vermilion and ochre, and trace in their hooked noses and black hair the features of the shepherd-kings who subsequently held Northern Egypt under their sway for 600 years, as well as of the Children of Israel and the later population of the Delta. For a time came when the Egyptians were driven out of the rich and fertile lands of the Delta, the first seat of their power and civilisation, and their places taken by the traders of Tyre and Sidon and the agricultural tribes of Southern Canaan. Henceforward the Delta received a new name among the subjects of the Pharaohs; it was called Caphtor or "Greater Phœnicia," since here the Phœnician Semites found a richer territory and broader lands in which to expand than in their own narrow coast-line at home.

It is to these Phœnician settlers that we owe our present alphabet. They were, as I have said, an enterprising people, and their commercial business soon taught them the value of the writing of which their Egyptian neighbours were possessed. But as became men of business they were a practical people as well as an enterprising one; they felt none of that conservative reverence for the past which prevented change and innovation among the Egyptians, and so when they went to school in Egyptian learning they carried back with them not the whole cumbersome hieroglyphic system with its ideographs, its syllabic values, and its polyphony, but its alphabet only. All else was discarded; they found twenty-two characters sufficient to express all their thoughts and speech, and twenty-two characters only they accordingly kept. These twenty-two characters constitute the so-called Phœnician alphabet, which was handed on by the Phœnicians on the one side to the Hebrews, and on the other side to the Greeks, from whom it has descended through the Romans to ourselves. The Egyptian characters were borrowed by the Phœnicians of the Delta, not in their hieroglyphic but in their hieratic forms, as two or three examples will make self-evident.

(To be continued.)

RECENT PROGRESS IN ANTHROPOLOGY

AT the annual meeting of the Anthropological Institute on January 27, the president, Dr. E. B. Tylor, delivered the anniversary address. He compared the present state of the science with that of a generation ago, as shown in the addresses of 1847-8 delivered by Dr. Prichard to the newly-formed Ethnological Society. In those days it was still commonly believed that the broad-skulled tribes, whose remains are found in our early stone-age burial-mounds, were of the Keltic race; in fact, the so-called Ancient Britons. How backward comparative philology then was is shown by the fact that so eminent a scholar as Colebrooke fancied that Tamil and other Dravidian languages of South India were mere degraded dialects of Sanskrit. Prichard was the founder of English anthropology, but between his time and ours lie two events which have transformed it, namely, the development-