SCIENCE

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VANDALISM AMONG THE ANTIQUITIES OF YUCATAN AND CENTRAL AMERICA.

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THE ancient buildings and sculptures of Yucatan and Central America have within a few years been much damaged and disfigured by the indifference of the natives of those countries, and by the vanity of travellers, some of them unfortunately American, who paint their names in large characters on the sides of the buildings and carve them on the sculptures.

Briefly, I will enumerate a few instances that have come under my personal observation.

The magnificent "House of the Governor" in Uxmal, probably the grandest building now standing in Yucatan, is almost covered with names on the front and on the cemented walls inside. These names are painted in black, blue, and red, and the letters are in some cases twelve inches high, and here are to be seen the names of men who are widely known in the scientific world. The "House of the Dwarfs" in the same city has suffered in a like manner. Many of the sculptures which have fallen from the buildings in Uxmal have been wilfully broken, and I noticed particularly that two of the beautifully carved turtles from the "House of the Turtles" had been broken apparently by a machete.

The large face figured by Stephens in "Incidents of Travel in Yucatan," Vol. II., p. 434, is in a mound in the backyard of a shop in Izamal. This has been almost destroyed. The whole of the face between the eyes and the lower part of the chin is gone, and I was told that the stones thus obtained were used in repairing a fence. On the other side of this mound is the bas-relief in stucco discovered by Charney, and this is slowly crumbling away. The steps leading up to the top of the Great Pyramid are being thrown down; and many mounds in Yucatan are being destroyed at the present time to furnish building material. In fact, if a bee's nest should be found in one of the old buildings, the Indians would tear down part of the structure to get at the honey.

In Copan, when the Peabody Museum Honduras Expedition compared the condition of the "Idols" to-day, with the photographs taken by Mr. A. P. Maudslay seven years ago, it was found that during that time some of the very finest sculptures had been disfigured by blows from machetes and other instruments. The Stela given as a frontispiece in Stephens's "Incidents of Travel in Central America," Vol. I., has been much marred by some one who has broken off several ornaments and a beautiful medalion face from the northern side. One of the faces and several noses have been broken off from the sitting figures on the altar figured by Stephens in the same volume, opposite page 142. On some of the idols and altars names have been carved, notably on the back of the Stela figured opposite page 158 in Stephens, and a large fragment has been broken from the same Stela. While excavating in one of the chambers of the Main Structure we uncovered a beautiful hieroglyphic step, but before we had time to secure a photograph of it, some visitor improved the opportunity while no one was about to break off one of the letters.

In Quirigua a small statue, discovered by Maudslay and removed by him to a small house near the rancho of Quirigua, had the head and one of the arms broken from it during the interval between two visits. This statue was of the highest importance, as it very much resembled the celebrated "Chaac-mol" now in the Mexican Museum, but discovered by Le Plongeon at Chichen Itza. One of the Stelæ at Quirigua has had a name carved on it quite recently; but the sculptures of this place are in a much better state of preservation than those of Copan owing to their being at some distance from the road, and being covered with a dense tropical growth; while those of Copan are within a mile of the village, and there was formerly a road over the Plaza Grande and among the idols. The burning of the bush, to clear the land for milphas, has also injured many of the sculptures owing to the cracking of the stones by the heat.

While in Nicaragua I learned that the sculptures on the Island of Zapatero in Lake Nicaragua have within a few years been much broken and disfigured. These were described by Squier in "Nicaragua, Its People, Scenery, Monuments, etc.," Vol. II.

As the governments of Mexico and the Central American republics are making little or no effort to preserve or care for the antiquities within their boundaries, it remains for the United States to do something to preserve these vanishing memorials of the past. The initiative has been taken by the Peabody Museum, Cambridge, which has been granted, for ten years, the care of the antiquities of Honduras A wall has been built enclosing the principal remains in Copan, and a keeper been placed in charge with strict orders to allow nothing to be destroyed or carried away. Thus a strong effort is being made by the Peabody Museum to protect the wonderful carvings in stone of the ancient city of Copan.

ANCIENT JAPANESE CLOCKS.

BY FRANK D. SKEEL, A M., M D., NEW YORK.

THE ancient Japanese, in common with most Oriental nations, measured time by the position of the sun. Their day commenced and ended with sunrise. As Japan lies between the thirtieth and the forty-fifth parallels of latitude, the days and nights vary considerably in length during the year. To fulfil the conditions of their notation a timepiece must divide into equal parts the periods of daylight and the periods of darkness. To construct a timepiece which will perform this erratic division of time is a mechanical problem of no mean order. This, the ancient Japanese have accomplished in several very ingenious ways.

Their clocks may be roughly divided into two general classes:—

1. Those with a constant rate, in which the changing length of the hours is indicated by the spacing of the numerals, which are engraved on movable pieces of metal.

2. Those with a varying rate, having the numerals equally spaced, the length of the hour being regulated by the rate of the clock.

Under the first division there are two types, namely, clocks with rectilinear dials, and clocks with circular dials. Clocks of the former type are driven by a weight or a spring. Those of the second type by weight only. The power is transmitted by a cord or chain to which, in clocks with rectilinear dials, the index is attached. The hour-signs are engraved on separate pieces of metal, which slide in a vertical groove in the front of the case. Parallel to this is a slit in the case, through which the hand is attached to the cord. The hours of day and of night are indicated by different characters. The spaces between these signs are regulated by moving the pieces of metal bearing the hour-signs nearer together or farther apart as occasion may require. Some clocks of this type are provided with graduations and a table by which the hour-signs may be properly adjusted in accordance with the season of the year. The hand moves downward over the face of the dial as the clock runs down and resumes its place at the top when it is wound. The escapement is the verge, with crown-wheel, balance-wheel, and hairspring. The driving-power is either a weight or a spring, as before stated.

In some weight-clocks the striking-train and bell comprise the driving-weight. The striking mechanism is released by pins projecting from the back of the little plates carrying the hour-signs. These pins trip a small lever as the train passes. Clocks drawn by a spring have the spring-barrel located in the lower part of the case

A clock of this type in my possession has the general appearance of a hall clock of our grandfathers' days except for its diminutive size. It is eight inches high, three-fourths of an inch deep, and one and one-fourth inches wide. The case is beautifully made of dark wood. The upper part of it, enclosing the works, has glass front and sides, the cap over the balance-wheel, as well as the front plate of the works, which are of brass, is open-work of graceful design and is gilded. Another clock of this type, also in my possession, is still more diminutive in size, being only three and three-fourths inches high, one-fourth inch deep, and three-fourths inch wide. It is made entirely of brass except the numerals, which are of silver, and is beautifully engraved and gilded. At the bottom of the case there is a small compartment closed by a hinged door. This contains the key. The numerals are fitted into a dovetail groove in the front of the case, and the hand is carried on a sliding-piece attached in the manner before mentioned to the fusie chain. There are no divisions to indicate the fractions of the hour.

Another interesting example of this type has a dial engraved with a series of logarithmic curves. On the faces of these clocks there are two rows of characters; when the dials are rectilinear, the characters are arranged in two vertical columns; when circular, in two concentric circles. These rows are some little distance apart, and the characters are unequally spaced. Each numeral is connected to its opposite one by a logarithmic curve. The space between the columns is divided into twelve equal parts by parallel vertical lines, each line having at its upper extremity the sign of a month. The space included between the intersections of one of these lines with two successive logarithmic curves, will indicate the length of the corresponding hour for the first day of the month which is indicated by that line. In this clock the index is borne on a cross-bar, which extends across the dial from one column to the other and is attached to the weight-cord. The index is so affixed to this bar that it can be moved along its length, thus passing from one line to the other as the months elapse. When this kind of clock is provided with a circular dial, the logarithmic curves are laid out in the same manner and intersected by parallel concentric circles. The hand moves over the dial and is constructed so as to slide through its attachment to its arbor, thus being lengthened and shortened.

Another clock of this type has a much more complicated structure. Its circular dial revolves and is furnished with movable hour-signs, which are arranged in concentric circular grooves on its face. A pin projecting from the posterior face of each opposite hour-sign enters the groove in a slotted arm which extends across the back of the dial. These arms are acted upon by an eccentric, which in its turn is driven by a train of wheels completing its cycle in a year. The action of this mechanism is such that the opposite ends of the arms and consequently the hour-signs are separated and approximated as the days and nights vary in length.

It only remains to describe the clocks of the second class, viz., those in which the rate is made to vary in accordance with the seasons. None of these clocks, as far as I am aware, have the balance-wheel and hairspring, but they have its forerunner and immediate ancestor, the escapement of Huygens, which consists of a vertical staff suspended by a fine silk thread attached to its upper end. This staff is provided with lugs which engage the teeth of a crown-escapement wheel, and it bears a horizontal arm from which small weights are suspended like a scale-beam. The rate of the clock is regulated by the adjustment of these weights. In general form, these clocks are rectangular or cube-shaped. The gong is placed on top of the case. The dial is circular and revolves from right to left, the hand being stationary. The case is of brass and is usually highly ornamented. The variation of rate in these clocks is accomplished in two ways, viz., (1) entirely by the adjustment of the weights borne on the arm of the escapement, and (2) partly in the foregoing manner and partly by the mechanism itself; the latter form having a double escapement, which will be described later.

The specimen of the former kind which I have is two and one-half inches wide, two and one-half inches deep, and seven inches high over all. The case is of brass, and is beautifully ornamented by chasing, and the wheels, which are cut by hand, are very accurately made. The characters are engraved on the dial in two circles, the outer one being composed of the signs of the Chinese Zodiac, and the inner one, of the hour-signs. Below the dial, on the face of the clock, are two openings, through each of which may be seen an astrological character. These characters change once in twenty-four hours. The weight-cords run over spiked pulleys and have small counter-weights. The clock has a striking-train and a going-train.

Another clock of this form in my possession is of more complicated construction. It has two escapements, the horizontal arms of which are of different lengths. In this clock the variation of rate is accomplished partly by hand and partly by the automatic operation of the mechanism itself. One escapement remains idle during the day and the other during the night, the staff of one being lifted from its engagement with the escapement-wheel at the same time that the other is brought into gear. This is accomplished by two levers which lie directly below the ends of the vertical staves of the balance. The opposite ends of these levers are acted upon by two cams on the same arbor which cause one of them to rise and the other to fall at the proper moment.

I have omitted to say anything of the fantastic astrological meanings of the various characters found on these clocks and of the intimate connection between the astronomy, astrology, and horology of the Japanese, and will only add that if they are children in imagination they are certainly giants in mechanical execution.

In writing this article I have availed myself of the articles written by Emil James, Journal Science D'Horology, Vol. VIII.; Aneè and Thomas Eggleston, Ph.D., in the School of Mines Quarterly for July, 1882.

SOME BIOLOGICAL NOTES ON AMBLYSTOMA TIGRINUM I.

BY HENRY LESLIE OSBORN, PH.D., ST. PAUL, MINN.

THERE is a salamander, most probably of the species named above, which is very common in this vicinity. In the autumn months, especially during September, it can be found abundantly in cellars or in damp, dark, or semi-dark places about buildings. I have often seen it on the railroad tracks imprisoned between the rails, and many specimens which had been run over and killed by the cars can be found at this season. Occasionally they are seen creeping about on the walks or in the grass, where they are frightened by man's approach and run actively away. They are familiarly called lizards, and the use of that word among the people of this vicinity can almost always be understood to refer to this animal. It lives in aquaria for an indefinite time, remaining on the bottom, and coming to the surface for renewal of air of the lungs rarely.

1. The *markings* of this salamander are vivid yellow spots upon a ground of brown-black upon the back, giving place to faint bluish ground and lighter color on the ventral surface. There is a very great deal of variation in the shape and distribution of the spots. In general, they are irregular, elongate figures of various sizes from very small rounded ones up to those of considerable size, whose length may be equal to half an inch. The directions of the long ones of the spots are not the same, while they are chiefly antero-posterior, some are oblique from behind, forward and inward, while others are oblique from behind, forward and outward. The patterns of the two sides are not "mated," they are entirely independent. Not only so, but there is a distinct line which separates them, and in the middle a black line often cuts directly through the spots, so that, while they meet, they do not match. This last-named condition is very noticeable in the tail, as shown in the accompanying figure. It is very conspicuous in many cases, but perhaps less noticeable in specimens