

Correspondence.

The Advertisements in the Subway.

To the Editor of the SCIENTIFIC AMERICAN:

Allow me to express appreciation, from a bacteriological standpoint, of your recent editorial condemning the devices set to accumulate dust and dirt in the Subway stations.

It seems incredible that at this time, just when the city has appropriated a large sum of money to investigate respiratory diseases, a condition such as that represented by the Subway stations should be allowed to exist. The Subway under the best of conditions will be a good lurking place for disease bacteria, and every possible means should be used to prevent this.

The more modest of the citizens who practice the filthy habit of spitting will use these Subway ornaments to hide the evidence of their uncleanness and each one may become the focus for the dissemination of respiratory disease.

When future generations come to a better knowledge of conditions influencing the spread of disease, they will have to acknowledge a debt of gratitude to the press that is now doing so much to aid science in the adoption of the right kind of hygienic laws.

ROBERT J. WILSON, M. D.,

Instructor in Bacteriology.

The University and Bellevue Hospital Medical College, New York, November 3, 1904.

Vacuum Tubes.

To the Editor of the SCIENTIFIC AMERICAN:

In some recent experiments the writer was astonished to find that a vacuum tube could be made to glow without the use of apparatus. This fact, perhaps familiar to some, will be new to others, and being easily demonstrated, seems worth describing.

If an ordinary incandescent electric light bulb or a Crookes tube or radiometer tube is subjected to rapid friction with the hand, it will be found that the whole interior of the tube glows with a faint, bluish light. The light lasts only during the actual friction against the tube, fading out almost instantly. It does not matter how the tube is held, the only condition being that the motion shall be rapid and light, several times a second, the hand leaving the tube after each stroke. The glow fills the whole interior of the tube, but is usually more intense at the point of rubbing. The condition of the atmosphere, the matter of insulating or grounding the tube, heat and cold, have no apparent effect upon the light. Of the various substances used as rubbers nothing was found to answer better than the hand. The intensity of the light depends to some extent upon the state of the vacuum, as some tubes respond more readily than others. Tests with the photographic plate show that the light possesses but feeble actinic power. In order to see the glow it is necessary that the room be absolutely dark.

The existence of the light probably depends upon the production of electricity, although its apparent indifference to atmospheric conditions, insulation, heat and cold, is difficult to reconcile with this view.

Media, Pa., October 11, 1904.

C. M. BROOMALL.

THE ANCIENT RACES OF YUCATAN AND MEXICO.—I.
BY RANDOLPH I. GEARE.

Judged from the standpoint of mystery, it is no wonder that the history of the ancient American races which occupied Yucatan and the territory to the south and west, and built cities, such as Mitla, Uxmal, Chichen-Itza, Palenque, and hosts of others, whose ruins are still in some instances substantial evidences of a high degree of civilization, has excited the interest of the greatest archaeologists of the United States, of Spain, of England, and of other countries. Their explorations have produced most valuable results, and numerous books have been published describing these ruined cities and the principal buildings which they contained. For this reason the present article will not deal, save incidentally, with the ruins, but will be devoted chiefly to a discussion of the history and manners of the builders.

Numerous theories have been advanced as to the origin of the three great original American races, namely, the Mayas, who occupied Yucatan and Chiapas; the Nahuas (or Aztecs) who settled in the Valley of Mexico; and the Zapotecas, whose home was in Oaxaca. The early Greek historians believed that over the middle portion of what is now the Atlantic Ocean there was once a broad continent, called Atlantis, inhabited in early days by a highly-cultured race of people, who gradually but persistently extended their sphere of occupation until at last the gods became angry with them, and punished their greed for territory by submerging Atlantis beneath the waters.

However this may be, it is certain that into this strange and (comparatively speaking) newly-begotten land, pioneers of the red race found their way; and, attracted by the fertility of the land, as well as by the presence of the numerous huge natural wells

which seemed to lead down into the very bowels of the earth, built themselves habitations. Here they prospered and multiplied; and as they were comparatively isolated and free from interruptions, went on from century to century building cities and developing their various arts, until in time each great well or group of wells was enriched with temples and palaces, grand in proportions and rich in unique though barbarous sculptures. For a long time comparative peace prevailed, and the several communities seemed welded together in a strong and permanent union—the first United States of America! But the rapid development of many centers of culture and power led to jealousies and feuds; and from native sources it has been learned that only a few decades before the arrival of Columbus disastrous wars ensued, depopulating many districts altogether, and reducing the cities to ruins. Then it was that the strong impetus toward culture of these remarkable people, who had passed through all the gradations intervening between a savage and civilized race, weakened, and the contentions of numerous chieftains, pitted against one another, dissipated the essential elements of national strength. It was at this juncture that the Spaniard appeared upon the scene with his warlike fleets, seeing which the warring and partly scattered tribes once more became reunited, and a bold, common system of defense was organized. Though largely superior in numbers, however, they were entirely unable to withstand the assaults of the Europeans with their improved modes and weapons of warfare, and by the force of the gun and the horse Spain easily secured a permanent foothold, which otherwise probably could not have been obtained for centuries, if at all.

The natives declare that the whole of Yucatan, and indeed the greater part of Central America, was at one time ruled over by one king, and that it was then called "Maya" or "Mayapan" (banner of Maya). In very ancient times the peninsula was known as Mayax, or the "first land."

The Maya language is still spoken more than the Spanish by the natives of Yucatan, of Peten, in the northern part of Guatemala, in the Lacandon country, on the shores of the Unmacinta, and in the valleys of the region called "Tierra de Guerra."

As a rule the Mayas were dignified, grave, and somewhat inclined to melancholy, yet some of them were very witty and clever jesters. The women were pretty, and lighter in color than the men. They were loving and lovable, exceedingly modest and industrious. It is said that even now no Yucatan Indian is ever rough or clumsy. They are scrupulously clean, in marked contrast to the aborigines of Mexico. Both sexes wore white cotton garments, those of the women being ornamented with colored embroidery. Some of the men wore handsome cloaks, made of stuff resembling fine damask of many hues.

There were Maya colleges for both sexes of the higher class, and also convents. The nuns lived like the Roman vestal virgins, and any of them who failed to keep their vows were killed with arrows. The high priest, however, if so desired, could sanction a vestal leaving the convent and marrying.

The young men were treated with much severity. It was considered disrespectful for them to amuse themselves before their elders, so public buildings were provided where all the youths congregated for recreation, including athletic sports, acting, singing, and dancing.

One of the most remarkable discoveries by the Spanish priests concerning the ancient Maya religion is that they practised baptism and confession. The baptismal rite was called Zihil (to be born again), and was celebrated when the children were between three and twelve years old. It consisted in part of sprinkling them with water. As to confession, husband and wife told their sins to each other, which afterward were made public, so that all could implore their god Ku to forgive the offending one. They believed that when they died, they went to a place where they would suffer for their sins, progressing later to a happy state, and that after a lapse of time they would again be reincarnated on this earth.

The Mayas were not formerly idolaters, although ages ago they regarded the mastodon as fit to represent a god, because it was the largest and most powerful creation known to them. But it was only a symbol, and was not regarded as a real god. They also adored the sun as the source of all light and heat, hence their worship of fire as emanating from the sacred orb. They believed in one unseen, incomprehensible power (Ku). The present Mayas, on the other hand, are quite different. They are idolaters, and have blind faith in wooden saints or images, before which they devoutly say their prayers.

The ancient Mayas expressed a loathing for eating human flesh, and they hated the Mexican Indians because they practised cannibalism. Nor is there proof that they made cruel sacrifices of human beings, although some of them, with the hope of gratifying their deity, would voluntarily throw themselves into one of the large natural wells (*Senote*), firmly believing, how-

ever, that on the third day they would rise again. This is certainly significant, as it hints at their belief in the resurrection of the body—a doctrine commonly ascribed only to the Christian faith.

At the time of the Spanish conquest, the lower classes of the Mayas practised inhumation, the grave being in or at the back of the house. The mouth of the corpse was filled with corn and some money, consisting of tiny copper bells and bright red stones. With the body was placed some article indicating the calling of the deceased, and some provisions. They were buried lying at full length, but one tribe, dwelling between Guatemala and Chiapas, doubled up the legs and brought the face into contact with the knees, binding the body and placing it upright in a round hole.

When the Spaniards took possession of the land, the Mayas were still a populous nation, numbering not less than two million souls, although at the present they are believed to have decreased to about one-fourth of that number. In the northern part of the land they still occupy there has been much commingling with Spanish blood, while in the interior there are yet some tribes that have never yielded their independence, and still oppose the approach of white men.

The only existing witnesses of their former greatness consist of ruined temples, palaces, and other national buildings; in fact, the Maya territory, which now occupies some seventy thousand square miles, is literally dotted with the ruins of towns and large cities, which were once teeming with life and activity. They had their arts and industries, too; and their books, of which many examples are to be found in European libraries, give evidence of much skill in glyptic and pictographic writing. They also had a system of time-keeping, which was so accurate that they are believed by some to have borrowed certain parts of it from eastern countries. They also had and still have a well-developed language, which in grammatical construction is said to resemble English more than any known American tongue. In commercial and agricultural pursuits they were eminently successful, trading with Cuba and many other ports, perhaps including Florida. Their textile and ceramic arts, says one writer, were practised with especial success, certain varieties of earthenware obtained from the southern Maya areas ranking among the highest work of its class in America. Thus it is evident that the Mayas were not an ignorant, enslaved race, but rather a people endowed with a high mental order as compared with some other native stocks.

In appearance the Mayas of to-day are dark, sturdy, and short, and in general may be said to possess the usual characteristics of the red race. One writer says that while their origin is largely a matter of conjecture, one account of them connects them with the history of the god and culture-hero Itzamna, and derives an important division of the race from the East, where, as already hinted at, they are said to have come across, or rather through, the area now occupied by the waters of the Atlantic Ocean.

It is worthy of note here that, however striking may be the parallel between the Mayas and the Aztecs in arts and customs, their languages are quite distinct, and the similarities between them are probably due to the fact that in the course of their history the Mayas were at times in contact with the great tribes that inhabited the Mexican plateau. "Indeed," writes Mr. Holmes, "all may have had a common origin to the north of Mexico, or even beyond the Rio Grande." It seems certain, at all events, that the Mayas were from the standpoint of culture ahead of all other American tribes, and although barbarians, in the strict sense of the word, were still on the border of a high civilization. Unlike savages, they had a system of keeping records, and were probably the only race on this continent that had made headway in developing a phonetic system of writing. Thus, their hieroglyphs, which have lately received much attention, and regarding which a very interesting paper by the well-known archaeologist, Dr. Cyrus Thomas, is being published in the Report of the Smithsonian Institution, occupy a place somewhere between pictographs and letters, so that a distinct period of literature was actually dawning in America when the advent of the Spaniards permanently interrupted its progress.

(To be concluded.)

The Carnegie Institute of Washington has just issued a pamphlet containing an account of a new method of determining compressibility by Messrs. T. W. Richards and W. N. Stull. Bromine, iodine, carbon tetrachloride, chloroform, bromoform, water, and mercury have been examined. In the case of a substance like bromine, the liquid is hermetically enclosed in a very thin, flexible glass bulb, and subjected to compression under mercury, correction being made for the change in volume of the mercury and the glass. A new form of high-pressure manometer has been devised, the working of which depends upon the difference between the compressibility of water and mercury.