Cherokee alphabet. As the presence of the stone in the mound cannot be attributed to an intrusive burial, it is evident that the mound must have been built since 1820, that Mr. Guess was not the author of the Cherokee alphabet, or that the stone is a fraud. The mound in which this was found is described as follows:—

"The Tipton group is situated on the north side of the Little Tennessee, about two miles from Morganton. No. 3 of this group, which stands about one hundred feet from No. 2, is of small size, measuring twenty-eight feet in diameter and about five feet in height. Some large trees," says Mr. Emmert, the Bureau agent, "were standing on the mound, and Mr. Tipton informed me that he had cut other trees off of it forty years ago, and that it had been a cluster of trees and grape-vines as far back as the oldest settler could recollect. There was an old stump yet in the centre, the roots of which ran down in the mound almost or quite to where the skeletons were found. . . . Having worked to the bottom, I found here nine skeletons lying at full length on the natural surface, with faces up, and surrounded by dark-colored earth. No. 1 (as shown in the diagram which accompanies his report) was lying with head to the south;

FIG. 7.

while No. 2, close by the side of it, had the head to the north, and feet almost touching the head of the other. On the same level, but apart from the preceding, were seven other skeletons lying closely side by side, heads all to the north, and all in a line. No relics of any kind were found with any of the skeletons except No. 1. Immediately under the skull and jaw-bones were two copper bracelets, an engraved stone (Fig. 7), a small drilled stone, a single copper bead, a bone instrument, and some small pieces of polished wood. The earth about the skeletons was wet, and the pieces of wood were soft and colored green by contact with the copper bracelets. These bracelets had been rolled up in something which crumbled off when they were taken out, but whether buckskin or bark I was unable to decide. The engraved stone was lying partially under the skull. I punched it with my steel prod on the rough side in probing, before I reached the skeletons."

As soon as the collections made by Mr. Emmert during this exploration were received at the office in Washington, a member of the Bureau was sent to the field where Mr. Emmert was at work, to learn the whole history of the find. This course was taken by the Bureau merely as a means of being fortified with all possible evidence as to the facts of the find being as stated. The examination by the person sent confirmed the statement by Mr. Emmert in every particular. This, therefore, necessitates one of two conclusions,—that the mound was thrown up since 1820, or that some one was at work on the Cherokee alphabet before Mr. Guess's time. But this is a question which has no bearing on the present discussion.

[Continued on p. 330.]

DR. FREIRE'S PROTECTIVE INOCULATION.—FACTS *VERSUS* FIGURES.[1]

THE *Medical Record* published some time since a translation of a communication, made by Dr. Domingos Freire of Brazil to the French Academy of Sciences, relating to his protective inoculations. This summary statement has been copied in this country by *Science*, and probably by other journals, and will doubtless be read by many who will never see a copy of the volume containing my official report[2] of investigations made in Brazil, in which I show that Dr. Freire's statistics are misleading, and that his "vaccinations" have no prophylactic value.

Dr. Freire's recent statistics have also been brought to the notice of the profession by an article by Dr. J. McF. Gaston, published in the *Journal of the American Medical Association*, March 22, 1890. In order that the profession in this country may be able to estimate Dr. Freire's statistics at their true value, I beg leave to call attention to the following facts:—

First, there has been no veritable discovery of the specific germ of yellow-fever, and consequently there is no "attenuated virus" at Dr. Freire's command with which to vaccinate against the disease. It is certain that the micrococcus, which he presented to me at the time of my visit to Brazil as his yellow-fever microbe, has nothing to do with the etiology of this disease. A careful bacteriological study of forty fatal cases, made in Havana since my return from Brazil, enables me to affirm this in the most positive manner.

There is, then, no scientific basis for the wholesale inoculations which Dr. Freire has made; and his statistics, when viewed in the light of certain facts not brought out in his publications, give no substantial support to his claims.

As my personal investigations were made in the city of Rio de Janeiro, and a majority of Dr. Freire's inoculations have been made in that city, I shall consider at present only those figures which relate to his recent inoculations in the Brazilian capital. With reference to these, Dr. Freire says in his latest publication,[3]—

"Between March 1 and June 30, 1889, 2,407 persons died of yellow-fever (including the deaths at the Jurajuba Hospital), 21 of whom had been vaccinated; that is to say, that 2,386 non-vaccinated persons succumbed to the disease (1,606 in the city, 800 at Jurajuba, in all)."

Now, the total population of Rio is estimated at 400,000. Let us suppose that 100,000 of this population enjoys protection from having suffered an attack of the disease: we have left 300,000 persons who may fairly be compared with those vaccinated by Freire, and who were exposed during the epidemic. The mortality upon this estimate is 1 in 125 and a fraction ($\frac{300000}{2386}$=125.7). Among the 2,087 vaccinated, there were, according to Dr. Freire, 21 deaths (*loc. cit.*, p. 16), that is, one in 99 and a fraction ($\frac{2087}{21}$=99.38). It will be seen that this comparison is not at all favorable to Dr. Freire's method. But no doubt he will claim that the comparison is unfair, and that the 2,087 vaccinated by him represent a greater proportion of susceptible persons than the 300,000 with whom we have compared them. Let us, then, deduct another 100,000 of the population, considering one-half as protected by a previous attack or long residence in the city. The remaining moiety includes the entire foreign population; Brazilians not born in the city of Rio; all young children, who, according to Freire, are to be classed with strangers as to susceptibility: in short, a population that may be fairly compared with those vaccinated.

[1] From the Medical Record.

[2] Annual volume of the Marine Hospital Service for 1889.

[3] Statistique des vaccinations au moyen des cultures du microbe atténué de la fièvre jaune (Rio de Janeiro, 1890).

The ratio of mortality under this estimate is 1 in 83 and a fraction ($\frac{200000}{2380}$=83.78). But in this comparison we have ignored some very important factors which are in favor of Dr. Freire's statistics. A large number of the deaths, no doubt, occurred among strangers who did not belong to the population of the city, and especially among the sailors on foreign vessels arriving during the epidemic, who are commonly sent to the Jurajuba Hospital when taken sick. On the other hand, we have no definite information as to the precise date when the vaccinations were practised, and no data with reference to the exposure before and after vaccination. In the statistics of previous years a very considerable number of persons were vaccinated after the epidemic had terminated; that is, persons who had passed through the epidemic season without contracting the disease were vaccinated, and counted among those supposed to be protected from an attack by this procedure. Evidently, the later in the epidemic the vaccinations were practised, the less value can be accorded to the subsequent exposure as a test of protection. Previous exposure without being taken sick is, on the contrary, evidence of comparative insusceptibility. To put those vaccinated on the same footing with the 200,000 of the population of Rio with whom we have compared them, they should have been vaccinated at the outset and exposed in the infected city throughout the epidemic season. How many were vaccinated when the epidemic had commenced to decline, or after it had practically terminated? How many left the city soon after being vaccinated? These are questions we cannot answer for 1889; but the facts with reference to 1884, 1885, and 1886 are given in my published report heretofore referred to, some extracts from which I beg leave to quote. Referring to the year 1885, I say,—

"Dr. Freire has omitted to state one very important fact with reference to vaccinations practised during the period included in this tabular statement. The date of vaccinations is not given. Fortunately, I am able to supply this omission from his journal containing the names of the vaccinated, which he kindly placed in my hands during my stay in Rio. I find from this record that the inoculations were practised as follows:—

January	392
February	342
March	611
April	139
May	273
June	813
July	481

"Now, it is well known that June and July are months during which yellow-fever does not prevail in Rio, and that, in fact, the month of May furnishes as a rule but few cases.

"The exposure even in an epidemic year amounts to very little during the months of May, June, and July, and may be considered practically *nil* in a year like 1885, when the whole mortality was only 278 in a city of 400,000 inhabitants. But Dr. Freire has included in his list 1,294 persons who were vaccinated during the healthy winter months of June and July, and who presumably had been exposed during the preceding comparatively unhealthy months of January, February, March, and April. If these 1,294 individuals were protected from an attack of yellow-fever by the inoculation practised in June or July, what protected them from being attacked during the preceding epidemic season? We must insist upon excluding these 1,294 persons from consideration during the year 1885, to which the report under review relates, and we think that it would be quite proper also to exclude those inoculated during the month of May, but will not insist upon this point. We have, then, to consider the value of the evidence offered by Dr. Freire as regards 1,757 inoculated persons, instead of 3,051 included by him in his statistics for the year.

. . . . . .

"Again I find, that in 1886, as in 1885, Dr. Freire has included in his statistics a large number of persons who were vaccinated after the termination of the epidemic, and whose exposure was but little greater than that of the 1,476 imaginary persons who must be added to his list in order to give the mortality of 1 per 1,000.

"Dr. Freire has not given us the date of his vaccinations in his elaborate presentation of his statistical results, but I find from his manuscript record that they were distributed throughout the year as follows (I place in parallel column the figures showing the total mortality from yellow-fever during the period):—

Month.	Vaccinations.	Total Deaths from Yellow-Fever.
1886.		
January	84	135
February	376	234
March	253	347
April	167	220
May	945	48
June	21	18
July	57	9
August	3	2

"This table shows that during the epidemic period, from Jan. 1 to April 30, there were 880 vaccinations, and during the same period 936 deaths occurred from yellow-fever; while during the months of May, June, July, and August, when the total mortality was but 77, the number of vaccinations was 1,026: i.e., a majority of the vaccinations were practised after the epidemic season was over, and upon persons who, no doubt, had for the most part passed through the epidemic season without contracting the disease.

"We turn now to the age of the vaccinated persons. Dr. Freire says, in his report first quoted, that the greater proportion of the deaths is comprised between one and thirty years. This is, then, the period most favorable for the development of yellow-fever. Now, it will be seen that among the number vaccinated, which we give in the second part of our statistics, 2,634 individuals are comprised in this period. But Dr. Freire has elsewhere shown us that the age which gives the greatest mortality is from twenty-one to thirty years. Let us then see what proportion of the vaccinated are included in these limits. Reference to his tables shows the deaths between twenty-one and thirty years of age to have constituted 39 per cent of the entire mortality, while only 15 per cent of the vaccinated fell within these limits of age. On the other hand, 43 per cent of the vaccinated were less than ten years of age, while the mortality for this period was only 12.5 per cent of the entire mortality. We note, also, that a large number of the children vaccinated were infants below two years of age.

. . . . . .

"In Dr. Freire's report under review, he says, on p. 7, 'We include in these figures all the vaccinated during the two previous years *who have been carefully observed during the epidemic season.*'

"That portion of the sentence which I have italicized surprises me exceedingly. From what has been said, it will be seen that a careful observation of the floating population of the cortiços, in which most of the vaccinated persons resided, would be practically impossible, even with a large force of inspectors at command.

"Dr. Freire himself did not find time to make the vaccinations among these poor people of the cortiços, but delegated this work to certain apothecaries. One of these, Mr. Telles, informed me that he had himself vaccinated between three and four thousand persons. He also communicated the startling information that none of those inoculated with the 'attenuated microbe' of yellow-fever had contracted small-pox during the recent epidemic in Rio, leaving me to infer that the vaccine was a protection against both diseases. This intelligent(?) apothecary, a mulatto, recorded a large portion of the statistics which Dr. Freire has tabulated."

I have said enough to show Dr. Freire's method of manufacturing statistics, and must refer the reader who desires fuller details to my published report. GEORGE M. STERNBERG, M.D.