

speak so slightly of the value of a photograph of the bank showing it as it actually was soon after the discovery, when he has himself given two fancy sketches, representing an impossible condition of things, to inform us how he thinks it might have been. The photograph of the bank taken by Mr. Mills, within six months of the time of his discovery, exhibits its face intact, and is a part of the evidence presented as to what was the actual condition of the gravel when the discovery was made. The haste with which Mr. Holmes has plunged into this discussion is shown by his statement on a previous page that Mr. Mills had "published nothing save through Professor Wright." The report of the Western Reserve Historical Society referred to by Mr. Holmes is entitled a report "by Mr. Mills and Professor Wright," and the specific account of the discovery is given in Mr. Mills's own words, in which he says that when a space of about six feet in length by two in height fell down, it exposed the specimen to view. It is true that that statement is not so explicit as it should have been, and I have given, in the *Popular Science Monthly*, the fuller details as given to us upon the spot, and as repeated two or three times to me in correspondence, namely, that the implement was seen by him projecting from the face of the gravel bank after the fall of gravel before referred to, and when the edges of the strata of gravel were all visible and undisturbed, and that he took it out with his own hands; or, if you want to avoid all error, that he worked it loose with his walking-cane until it fell out at his feet, when he took it up, made his notes upon it, and put it in his collection. Mr. Mills is as capable of drawing a section of the bank as Mr. Holmes is, and that he has done, but most readers will prefer to see a photograph, in which there is no danger of the incorporation of fanciful elements.

In view of all that Mr. Holmes has said of the importance of expert testimony, it is difficult to see, also, why he should say that observations upon Mr. Mills's moral character, education, and business reputation may not diminish the danger of error in such a case; for how else can you determine the value of an expert's testimony? If there is doubt about his moral character, that of course vitiates the evidence in a high degree. So, also, if there is doubt about his ability to discern the difference between disturbed and undisturbed gravel in such a situation, that would largely vitiate the observations. But Mr. Mills's education and habits of observation are such that his evidence in so clear a case as this is, is as good as that of any expert could be. What does Mr. Holmes suppose led Judge Baldwin and the other members of the Western Reserve Historical Society to incur the trouble and expense of going down to Newcomerstown, except it was to inform themselves of the capacity of Mr. Mills to bear testimony to the very points at issue? Of course, we cannot force conviction upon the minds of the public, but we can get the facts of the situation and the conditions under which the evidence was given with all possible clearness before them. If any portion of the reading public chances to be in the attitude of mind in which Mr. Holmes asserts he is in when he says he does not care for a photograph of the bank, and does not care to know anything about the moral character and education of the witness, and that he is sure that Professor Wright cannot possibly secure a proper authentication of the facts, it will be a difficult matter to overcome the prejudice with which the subject is approached. But the number who are biased to such an extent and are the subjects of such "invincible ignorance" is, I presume, not numerous.

Of course, I do not deny that there are things so improbable that they could not be established by any amount of human testimony. It is more likely that the senses should be deceived in some cases than that the things which seem to happen should really occur. But this is not a case of that sort. The existence of glacial man is not a highly improbable thing, and this evidence of Mr. Mills is in analogy with a vast amount of other evidence leading to a similar conclusion. There is nothing in the character of the implement, in the conditions under which it is reported to have been found, or in the testimony presented, to raise any serious suspicion of error. The fact that Mr. Mills was not specially impressed by the importance of the discovery at the time is not at all surprising, since his thought had been little di-

rected to the phase of the subject involved in his discovery. He had in his collection thousands of other implements found upon the surface, and, after making note of the circumstances connected with the finding of this, it was laid with them.

In conclusion, I would simply add that in procuring, as I have done during the past season, some sections of the gravel in undisturbed condition for the exhibit at Chicago, I have had ample opportunity to study its behavior, both when it is in place and when it is in a recently formed talus, and, in reply to Mr. Holmes's assertion that it is *impossible* to tell whether Mr. Mills found this in the undisturbed strata or in the talus, I would say that the observer who could not tell the difference would be one whose testimony was utterly unworthy of consideration. While I am about it, also, I might as well refer to the fact that there is a slight discrepancy, which may attract the attention of some, both in my own and in Mr. Mills's statements about the depth at which the implement was found. In "Man and the Glacial Period" I say, that it was *sixteen* feet. In my original report upon it, I say *fifteen* feet. In the more specific details given in the *Popular Science Monthly* I say *fourteen and three-fourths* feet, and Mr. Mills has sometimes spoken of it as fifteen feet and sometimes as fourteen and three-fourths feet. It is easy enough to see why both of us should say fifteen feet, for that is a round number, but not so easy to see why in one place I should have said sixteen feet. But the discrepancy is not one that materially affects the evidence. I presume, therefore, that my error arose from the principle of assimilation with which we are so familiar in the textual criticism of the New Testament. In the appendix to the third edition of my "Ice Age in North America," I give it as fifteen feet. But in writing the paragraphs in the later book, I had just had occasion to speak of one of Dr. Abbott's discoveries which was sixteen feet below the surface, and the close association of the two in my mind doubtless led to the substitution, and, since there was nothing specially dependent upon it, the discrepancy being so slight, my attention was not aroused through all the subsequent proof-readings.

PHARMACEUTICAL EDUCATION.

BY HENRY KRAEMER, COLLEGE OF PHARMACY OF THE CITY OF NEW YORK.

DURING the past year a number of papers have appeared in *Science* demonstrating the "onward march" of institutions of the highest learning, as well as that of professional and technical schools in America. The one cry to be heard all along the line is to raise the standard. The requirements for a preliminary education have been markedly increased and the courses of studies materially lengthened both as to the number of hours required per week and the years of study. In our colleges of pharmacy there have been a similar awakening and a desire to extend the course from two to three years. It may be well, however, at this point to state for the benefit of those who are unfamiliar with the requirements of our best colleges of pharmacy, that before a diploma is granted the student must have been engaged in the drug business for a period not less than three and one-half or four years. This means practically an apprenticeship of six years, although a great many students find it necessary to work in drugstores while attending colleges.

The teachers of pharmacy have for a number of years been discussing ways by which students will be compelled to devote all of their time to college work during the sessions of study. Yet while they claim that students should not be employed as clerks in the stores and at the same time attend college, the employers are opposed to the students devoting so much of their time to college work during the winter session. There has been more or less of a compromise, but nevertheless colleges of pharmacy are raising their standard as are the other schools of learning, and it is very probable that, in a few years, three solid sessions of undivided work as well as four years' apprenticeship will be required before a candidate shall receive his or her degree.

The position of the pharmacist is a peculiar one. He, in the majority of cases, does not make his living by means of his actual business in medicines and prescriptions. He finds it necessary to

carry a line of goods known as "druggists' sundries" and "patent medicines." These, and more especially the latter, he would give up if he could, but the line of competition is so great and the public still expect the pharmacist to carry any-and-everything to suit their convenience, that it seems only practicable to a very few to abandon these in their business. The public also expect the pharmacist to know something of everything, and whatever it be, whether ills or troubles or discomforts of any kind, they run to him. I remember, when attending college, one of the professors, who was a practising pharmacist for a number of years in one of the best localities in a large city, telling us that one night he was hastily summoned by a neighbor to his house, where, in the midst of a splendid reception, the gas had suddenly gone out, and, not knowing what to do, they sent for the pharmacist. He went, and being of a practical mind and true to the instincts of his discomforted neighbor, he remedied the trouble. This simply illustrates the very close relations of the pharmacist to the public.

Now, as soon as the public will expect the pharmacist to deal in medicines only and all other articles related to the art of medicine, then the pharmacist as a business man (which he must be) will confine himself to the labors of his profession. And as soon as he can confine himself solely to the art of pharmacy as taught in our colleges, there will be no question of an extended curriculum of studies, as complete as that of any institution of learning. Then we shall have laboratories fully equipped in the particular kind of analytical and chemical apparatus which he needs for the assay of drugs and in their examination for purity. Likewise will the course in microscopical work be so extended that the pharmacist will make such analyses, for the busy physician, as the examination of urinary sediments and other discharges, such as sputum for tubercle-bacilli, etc. Indeed, it is in these two fields that the advanced work in pharmacy is tending, and accurate results will only be attained by thorough instruction in chemical and microscopical manipulation. There must be such a blending of chemical and botanical instruction that the pharmacist, while not a specialist as a chemist or a botanist, yet indeed is a specialist with regards to the practical application of these sciences as an aid to the physician in his healing art and in the preparation of pure medicines of definite and authorized strength. This condition of specialization will come, for pharmacists are marching onward in the line of progress; and it is only a question of a few years, when the host of young men, graduating by the hundreds from our colleges of pharmacy, and who are thirsting to apply their teachings and make their living in this practical application, will unite and raise the standard of their business to the profession which it is theirs to make it.

THE TELL EL-AMARNA TABLETS.

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THE Tell el-Amarna tablets, after some years of patient study on the part of experts, are now known to consist for the most part of a political correspondence of great interest and importance between kings, governors, and officers, who formed their plans, struggled with their difficulties, fought their battles, and made their exit from the worry and work of life 3,370 years ago. These letters are inscribed on brick tablets, and, as a rule, occupy both sides of the tablet. With two exceptions, which are from Hittite princes and in their language, the letters are written in an ancient form of the cuneiform script. They were found in the year 1887 by an Egyptian peasant woman amid the ruins of the palace of Amenophis IV., or Khu-en-Aten, at a place now known as Tell el-Amarna, midway between Minieh and Assiout, on the eastern bank of the Nile, about 180 miles by river south of Cairo. The tablets number 320. The writers of the letters from Palestine (178 in number) are Amorites, Phœnicians, Philistines, and others, and they are addressed to the Pharaoh of Egypt and certain of his officials. At the time of this correspondence (about 1480 B.C.) the power of Egypt was waning and Egyptian garrisons were

being withdrawn from Palestine in face of successful attacks by the kings of Armenia, Nii, Shinar, with the Hittites of Merash and Kadesh on the north, and of equally successful attacks by the *Abiri* (Hebrews) on the south. The letters state that the *Abiri* came from the desert and Mount Seir. Major Conder affirms that "the date of the letters is exactly that which is to be derived from the Bible (I. Kings vi., 1) for the Hebrew invasion, according to the Hebrew and Vulgate text, and it agrees with the fact that the Egyptian conquests made by the XVIII. dynasty (1700 to 1600 B.C.) had been lost when the XIX. dynasty acceded." It is certainly very interesting to find in the letters the names of Japhia (Josh. x., 3, one of the kings killed by Joshua) and most probably that of Adonizedek, king of Jerusalem; while the name of a king of Hazor is read as Jabin (Josh. xi., 1). It is also pointed out that the name of the captain of Jabin's host is, Egyptian, Sisera or Ses-Ra, meaning servant of Ra.

In most of the letters from the kings of the cities of Phœnicia and Northern and Southern Palestine the appeal is ever one for Egyptian troops to enable them to hold their cities for the Pharaoh, to whom they seem to have appealed in vain. The earlier letters of brave Ribadda, the king of Gebal (now Jubail, north of Beyrout), usually begin with the following salutation, which is given as a specimen of such salutations at that time, "Ribadda of the city of Gebal of his Lord, the King of many lands, the prosperous king, Baalath of Gebal, she hath given power to the King my Lord. At the feet of the King my Lord, my Sun seven times seven times I bow."

The salutation of the later letters becomes shorter and less ceremonious, as Ribadda felt that he was being left to his fate. Here is one of his appeals for help: "I have been hard pushed. Help speedily O King my Lord. . . . Soldiers and chariots, and you will strengthen the chief city of the King my Lord."

And what can be more pathetic than this, coming from that same brave heart, which has now for more than 3,300 years ceased to trouble itself about chariots, and men of war and Pharaohs who could not or would not come to his aid.

"And will not my Lord hear the message of his servant? Men of the city of Gebal, and my child, and a wife whom I loved, this son of war, the son of Abdasherah has seized; and we have made a gathering, we have searched; and I cannot hear a word spoken about them. I am doing my duty to the King my Lord, and once more, despatch thou men of garrison, men of war, for thy servant, and will you not defend the city of the King my Lord?"

On May 14, 1893, a cuneiform tablet was found by Mr. Bliss while excavating at the old Amorite city of Lachish, in Judea, in which the name Zimridi twice occurs. From the Tell el-Amarna tablets we learn that Zimridi was governor of Lachish, and, moreover, in a tablet from the king of Jerusalem to Amenophis IV., we are informed of the death of Zimridi at the hands of the servants of the Pharaoh just named.

Many matters of great interest in connection with these tablets can find no mention within the limits of this paper. It may be added, however, that the topographical value of these letters is very great; and also that the evidence which they afford as to the Hebrew conquest of Palestine under Joshua is in favor of the Bible chronology (Acts xiii., 20; I. Kings vi., 1) and against that of Dr. Brugsch and Bunsen.

SOME CONFLICTING ESTIMATES OF DISTANCE.

BY ARTHUR E. BOSTWICK, PH.D., MONTCLAIR, N. J.

ACCORDING to all authorities with which I am familiar, a small, regular pattern, if looked at squintingly, so that the horopter is nearer the eye than the pattern, but at such a distance that adjacent corresponding parts of the latter overlap and coalesce, should appear closer to the observer, and if looked at in like manner, but so that the horopter is farther from the eye than the pattern, it should appear farther away. This seems natural, for, in each case, the image on the retina being unblurred, the point to which the axes of the eyes converge should be taken as the distance of the object. In this case, the angle actually subtended by the pattern remaining the same, the mind should infer, in the