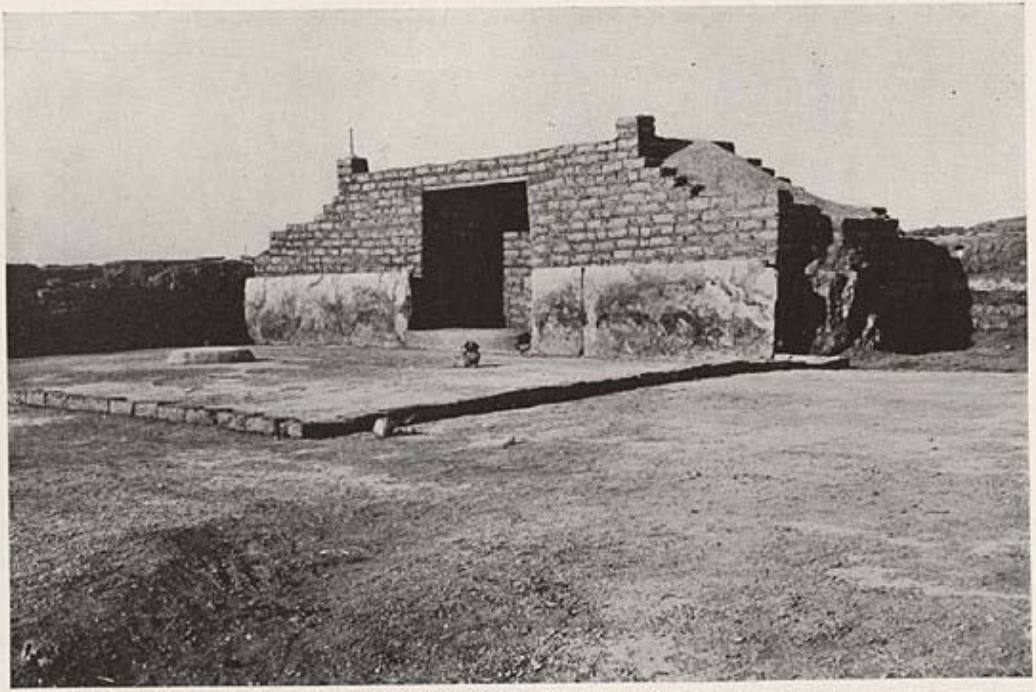


THE HOLY OF HOLIES OF THE TEMPLE OF NIN-EGAL, QATNA, WHICH ONCE CONTAINED THE GOLDEN STATUE OF THE GODDESS. THE RESTORATION OF THE UPPER PART OF THE EDIFICE SHOWED THAT THE BRICK WORK AND THE PROCESS OF CONSTRUCTION REMAINED THE SAME AT MISHRIFÉ FOR 4,000 YEARS.

THE ART OF EXCAVATION

By Count du Mesnil du Buisson
Director of Archaeological Excavations at Qatna, Khan-Sheikhoun and Souran, Syria.

"NOTHING is simpler than making excavations, and at the same time, nothing is more difficult. Excavating in order to collect objects without attempting to deduce from them one scientific conclusion is within the reach of all. But excavating with discernment, for the purpose of making the excavated material yield all possible scientific data, is the work of scholarship and experience." Thus did Jacques de Morgan express himself in his counsels to his collaborators. The guiding principle ought to be that reasoning is always true when it is based on exact knowledge and concise facts. On the other hand, errors will always occur when the facts on which one relies are themselves incorrect or inexact. Keen observation is, then, the basis for all methods of excavation. The more complex the problems presented, the more involved the social phenomena, the more important it is to set up criteria, based on comparable facts and free from erroneous conclusions. History has already been partially reconstructed on such principles; it is a question of continuing.

This idea leads us to ask what role excavation should play in historical research, what place its technique should take in the consideration of proper methods for furthering the study of human evolution.

History offers two ways of studying the past; through texts, that is, events as recorded by man, and through archaeology, that is, the evidence of material facts.

Archaeology is the *science of ancient monuments*, monument being taken in its etymological sense of *monumentum*: a memento, a vase, an amulet, a mummy, a stain of blood, even traces of footprints in a tomb are monuments. However fragile these things may be, however elusive, they are still material, they are visible and measurable, and capable of reproduction.

In reality, the study of texts and archaeology are two faces of the same medal. Both have their advantages and their inconveniences; men are more open and more communicative, but they are liable to false conclusions and prejudice; objects, more laconic and more obscure, are yet more credible. The best way, when possible, is to combine the two methods: lacking texts, the prehistoric sciences progress only with the greatest difficulty; and on the other hand, it is because of the neglect of archaeology that history has so long been entangled with legends.

In general, archaeology serves for the verification and explanation of texts, and it would evidently be a grave error to neglect either one of these two sources of infor-

Note: This study was made the subject of a conference by the same author at the Ecole du Louvre, **Cours sur la technique des fouilles archéologiques,** first year. Translated from the French.

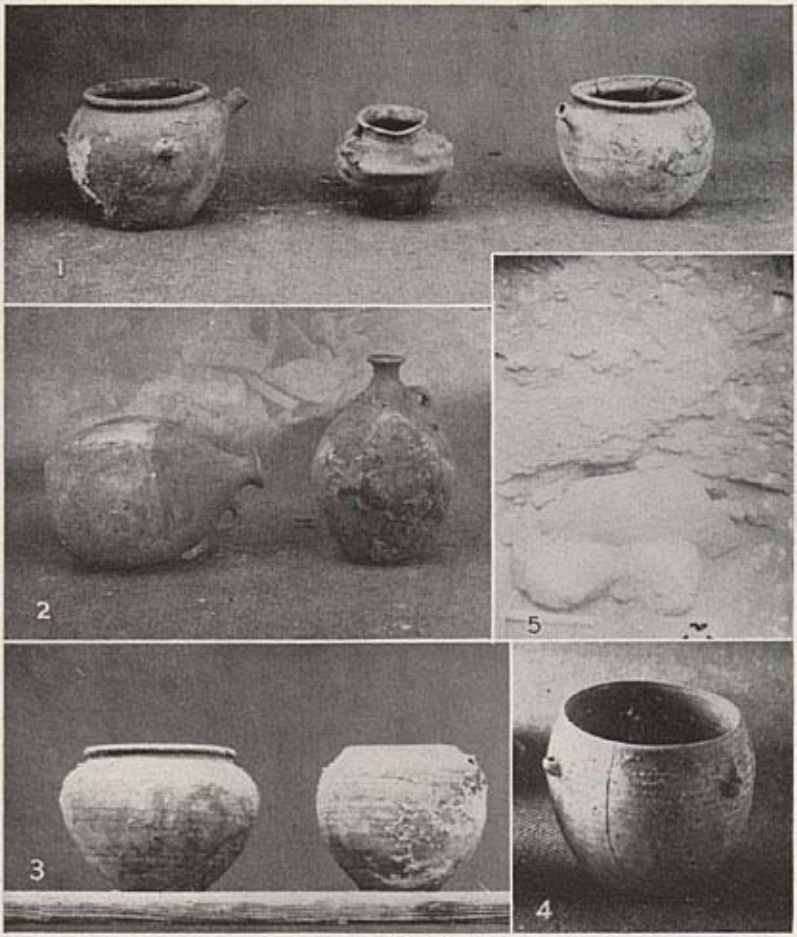
mation. In publishing texts, the excavator serves history; in publishing discoveries of monuments, he serves archaeology and thus history also.

I am greatly indebted for the plan I have followed in this study to *The Introduction to Experimental Medicine*, by Claude Bernard. This is a little book which I would advise everyone to re-read as a breviary for all scientific methods. The technique of medicine, like the technique of excavation, is an *art* intimately connected with the sciences. In medicine these sciences are physiology, pathology, therapeutics; in the technique of excavation they are, as we have just said, history and archaeology. As an art, medicine endeavors to nurse and to heal; equally, as an art, our technique aims to discover the material evidences of historic facts. The great difference is that the study of medicine, as the study of all other natural sciences, constantly makes use of experimentation; that is to say, it is capable of artificially producing phenomena; as for us, we have almost no other recourse but the observing of the material evidence, without being able to reproduce it. Our position is a little like that of the astronomer who is separated by millions of kilometers from the phenomenon of which he can see only the manifestation. Likewise, hundreds and sometimes thousands of years separate us from the event of which we see only the traces.

It should not be thought, however, that archaeology never makes use of experimentation; on the contrary, the following are two examples which show how experimentation may serve the excavator.

During my third expedition to Mishrifé, I had occasion to collect from the 300 vessels around Tomb No. 4, a residue which still adhered to the sides and bottoms. This residue, dating back more than two thousand years before our era, represented food that had been laid beside each of the numerous corpses buried in this vast tomb. M. Guillaumin, Director of the plantations of the Natural History Museum in Paris, was kind enough to undertake the ungrateful task of examining the contents of the hundreds of little bags which contained the residue we had carefully collected. In one of these he discovered particles of a paste analogous to that of bread or cake. The advanced state of decomposition did not permit us to determine the kind of flour used—whether wheat, rye, barley, etc.—nor the leaven, the manner of preparation, mixing and baking. M. Guillaumin conceived the idea of preparing numerous samples of different pastes, variously baked. He then exposed them to decomposition analogous to that in a tomb; that is, he placed them in dark and humid surroundings, thus obtaining from each of these carefully labelled samples, after they had dried, a powder that was easy to analyze chemically and to compare under the microscope with the residue found in the vessels. The experiment did not produce all the hoped-for results; but the method was excellent and worthy of imitation in numerous instances.

Knowledge of the composition of the concrete and mortar used in various epochs would be most useful in making comparisons of edifices. Restoration of monuments is often veritable experimentation, for it requires the solving of many problems and often leads to the discovery of the processes used by the ancients. When Legrain was



SEVERAL TYPES OF VESSELS (FIG. 1-4) FROM TOMB NO. IV, QATNA, IN WHICH WERE FOUND FOOD REMAINS THAT HAD BEEN PLACED NEAR THE DEAD. FIG. 5 SHOWS THE STONE CLOSING THE ENTRANCE TO TOMB NO. IV.

THE DINING ROOM OF THE MISSION DU MESNIL DU BUISSON AT QATNA. A COLLECTION OF VESSELS FROM TOMB NO. IV.

reconstructing the enormous columns of Karnak, did he not show by this *experience* how the ancient Egyptians were able to raise enormous blocks to astounding heights, and that they must have used analogous methods?

It was by means of breaking up pieces of flint and reassembling them that prehistorians were able to give an account of the processes used by ancient man in fashioning arms and implements. The technique of flaking from the core and the later percussion method were certainly developed through some elementary experience. We have here a means of investigation that is not to be neglected, but should be resorted to much more often than has been done so far.

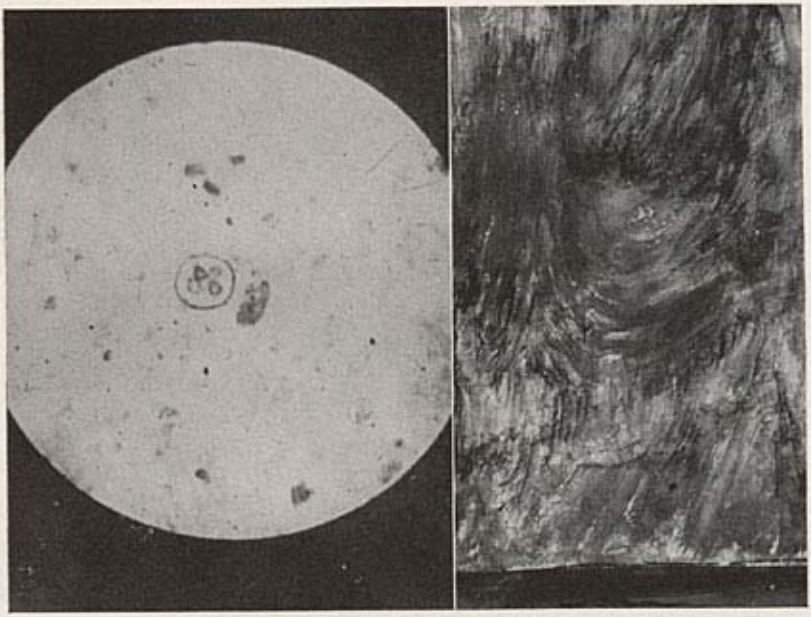
It is no less true that the technique of excavation is above all a science of observation, and that in most cases we have to limit ourselves to establishing a fact and explaining it by comparison with similar facts that are better known to us.

Moreover, excavation is a means in itself of developing our capacities, enabling us to get at remains otherwise inaccessible to us, and any method that helps us to supplement the keenness of our senses will be an extremely useful aid. In our technical studies we have examined the methods which ingenuity has suggested to

ONE OF THE SACRIFICIAL BASINS AT QATNA, WHICH BORE THE TRACES OF BLOOD. IN THE BACKGROUND, TO THE LEFT, IS THE HOLY OF HOLIES OF NIN-EGAL.

man in this regard. These methods are physical or chemical. To the first class belong cross-sections and colorations, examination under the magnifying glass and the microscope, all the methods, more or less perfected, of measuring and computation—spectral analysis, etc. . . . The second are based on the reaction of bodies on each other; this is analysis verified by synthesis, or simply, the study of their chemical properties.

The following are two examples which I again take from the excavations at Qatna. In clearing the southern part of the temple of Nin-Egal, near the southwest corner of the great temple court, we discovered two square plots surrounded by three meters of concrete. Each of these plots terminated toward the east in a round basin of masonry, the brim of which was on a level with the ground. We soon found that a little canal united the basin with the plot itself. After the basins had been carefully cleared, we discovered that several coats of whitewash had been applied similar to that used by the natives of the place even now for the interior and exterior of their houses. Examination under a magnifying glass enabled us to count the successive coats of whitewash, which proved at least that this place had been in service for a long time.



RIGHT, FACSIMILE OF THE STAINS OF BLOOD PRESERVED UNDER THE COATS OF WHITE-WASH IN THE SACRIFICIAL BASINS AT QATNA. LEFT, GLOBULES OF THE BLOOD OF BULLS FOUND IN THE SACRIFICIAL BASINS AT QATNA (MICROGRAPH).

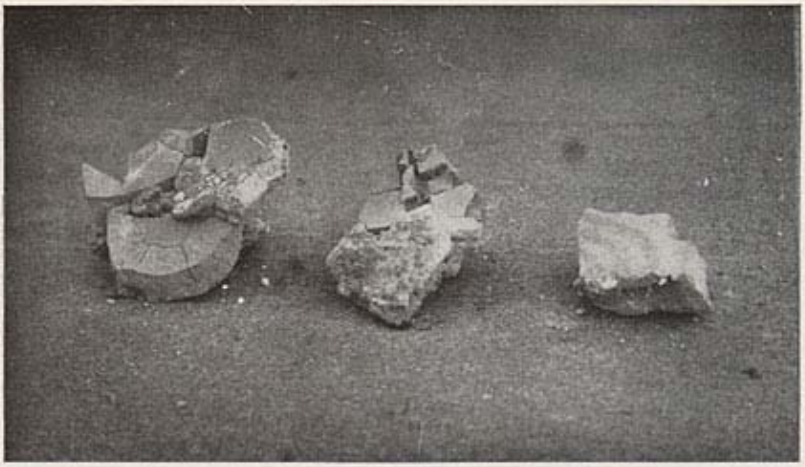
In one of the basins we observed between the coats of whitewash a clear, almost uniform, dark brown stain, which did not have the color of whitewash but might be due to diluted argil; near the bottom there were large brown stains which seemed to have been spread out by rubbing, as with a cloth or brush. We noticed also that the dark brown stain was repeated between the successive layers of whitewash. This was all that we could deduce from direct observation. Samples of the plaster taken from various parts were sent to the French laboratory for examination. As I suspected that the stains were traces of blood, I approached the Prefect of Police, who is experienced in analyzing such stains through his work with criminals. M. Florentin, Assistant Director of the laboratory, succeeded in applying coloring to these globules which, indeed, had existed for the last three thousand years, and was thus able to make them perfectly visible by magnifying them 250 times. He was even able to obtain the micrograph shown herewith. Here, one can plainly distinguish the *hematin* of a mammal that differs from that of a man. Unfortunately, since the blood plasm had been entirely dessicated, it could not be restored, and it is therefore impossible

VIEW OF THE TEMPLE OF NIN-EGAL, AT QATNA, AFTER COMPLETE EXCAVATION.

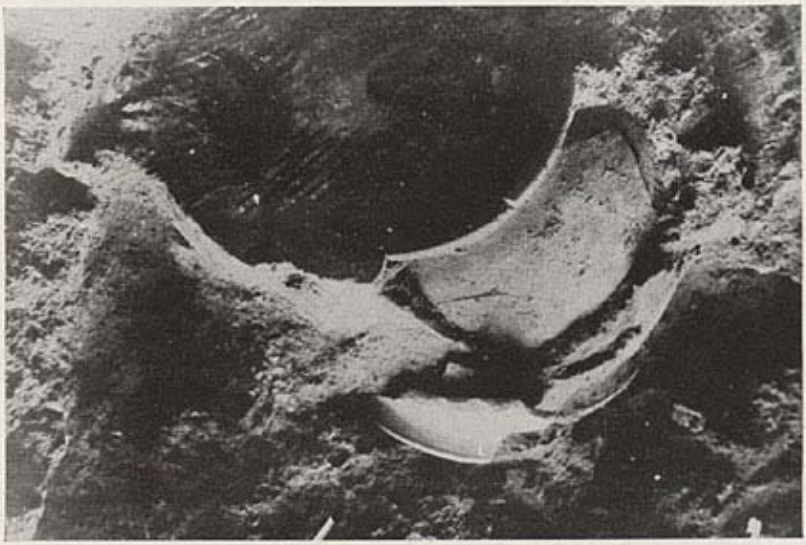
to specify more precisely. However, the information obtained is most valuable, and leads us to believe that we have discovered taurobolic vaults of the greatest antiquity.[1]

The following is an example of chemical investigation. As you perhaps know, the temple of Nin-Egal and the palace form a unit on the rising ground of the church of Mishrifé, comparable to that of the temple and palace of Solomon on the hills of Zion. The state of the remains proved at once that a violent fire had destroyed them; the ashes and the charred beams formed a layer which in spots reached a thickness of one yard. However, one could recognize differences in the composition of the magma. The stones of which it was composed had not undergone the same transformation through the action of the fire. Knowing that limestone burns at about 700°, gold at about 1000°, and basalt at about 1300°, we could create a sort of scale of temperatures. In the case of gold and basalt, their globulous appearance revealed at once that these temperatures had been reached. In order to determine the state of calcination of the limestone I used a solution of hydro-chloric acid, by the advice of

(1) Reports of the Académie des Inscriptions et Belles-Lettres, 1928, page 219.



FRAGMENTS OF A BASIN OF BASALT BURNED AND PARTLY MELTED IN THE FIRE AT THE PALACE OF QATNA.



PART OF THE FOUNDATION STILL IN PLACE UNDER THE TEMPLE OF NIN-EGAL, AT QATNA.

M. Orcel, Assistant in Mineralogy at the Museum. Thus, we could reëstablish the approximate temperatures reached at the time when these parts of the buildings were destroyed.

The greatest heat, that is to say, the melting point of basalt, was observed in the northeastern corner of the Hall of the Grand Vase; the minimum heat was evidenced in the unburned limestone in the outer courts to the north and south. This led us to the conclusion that these extensive esplanades must have been open to the sky, and that the northeastern corner of the Hall of the Grand Vase was approximately the center of the fire, two facts which the successive steps of the excavation seemed to indicate plainly. Moreover, a temperature sufficient to melt basalt can be explained only by a violent current of air, having the effect of bellows in a forge. This hypothesis was definitely confirmed this year by the discovery of a succession of doors creating an intensive draught. With regard to the gold, M. Orcel found this melted into microscopic globules; at times it appeared to be in the form of remains of gold leaf that had covered the cedar wainscoting.

These are only examples, but it is undoubtedly no exaggeration to state that the progress of the experimental sciences and of observation is measured by the perfecting of methods of investigation, and that the greatest scientific truths have their roots in the details of observation, which constitute to a degree the soil in which these truths are developed.

When an excavator has ascertained a fact by observation, his first anxiety is to preserve it, and to write a document which will serve at the same time as a proof of his finding, and a means of further study. To prevent any errors arising through the imperfection of the senses, through imagination or unskillfulness, he uses first and by preference, mechanical and automatic methods, the principle ones being photography, the making of models, casting and topography.

Everyone knows the marvelous assistance rendered by photography — both aerial photography and microphotography; large edifices, such as temples and theatres, circuses, road systems and unknown cities, have been discovered thanks to aerial photography. Topography assists automatically through precise methods of drafting and trigonometrical surveys. The personal quantitative is reduced to the minimum. The photographer, the molder and the topographer merely direct a work, the results of which they cannot affect. Their art — and it is a great art — is to direct it well. Intellectual or graphic methods merely constitute a complement, indispensable, it is true. These methods include description and sketches. However, even these are made as automatic as possible: description, by a definite and unvaried vocabulary and by a logical and unchanged order in the examination of the various characteristics involved, which, whenever possible, should be translated into figures; and in this regard, I will perhaps surprise you by saying that nothing is so difficult as taking exact measurements. Inclinations and cardinal points are always represented by degrees. The

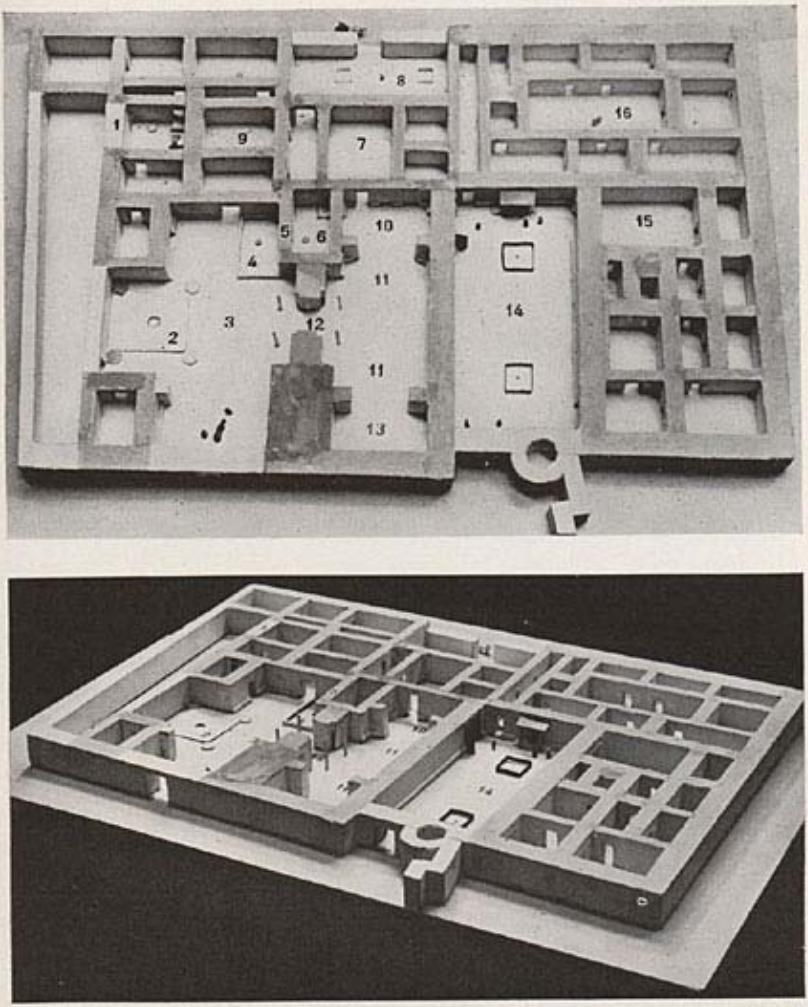
sketch is also rendered almost automatic by the application of a scale of measurements, the indicated walls, the theoretical cross-sections, and by the use of the *camera-lucida*. The sketch thus will duplicate the photograph without replacing it; one would be the intellectual and the other, the mechanical representation. The result of this system is that the publication will consist chiefly of photographs and drafts; with text and sketches alone there is too much risk of giving only the approximate truth.

My exposition would, however, miss its purpose if it would leave the impression that the excavator is a sort of automaton, merely a perfect registrar, that all his thinking, all his ability, all his ingenuity are centered on the one idea — to see more, to see better, and to record what he has seen. Even though this is indeed essentially his task, such a view would be too simple, and erroneous. The reality is far too complex, far too rich in detail, for one to dream of seeing all, much less of retaining and recording all. Moreover, a vague accumulation of facts without a guiding and animating principle would be sterile.

The excavator has, first, to direct the work according to certain observations; second, to choose and discriminate from among the facts presented to him by sites and monuments, the most characteristic and the most significant. In this choice, which governs his whole labor and that of his entire mission, the excavator is guided by reason, induction and deduction, always checking these with the facts.

The guiding principle is his hypothesis. This should comprise all that is already known about the subject, in order to guide the research with greater surety toward the solution of those problems which most interest science, and which would be of the greatest import for the continuation of the work. For example, having come across a building, he concentrates on the details characteristic of its purpose, or on the style indicating its epoch. If he discovers a fragment of an inscription, he will wish to find its original place, to collect the missing parts, and to determine by the indications, the circumstances of its destruction and the dispersion of the fragments.

Thus, the excavator must intellectually fix for himself two goals. When problems are as complex and as difficult to study as those presented by excavations, he will constantly meet with an unforeseen and isolated fact, without any connection whatever, seemingly inexplicable at first sight. His preconceived idea or hypothesis must then give way to observation, and the fact must be studied with the same care as if it had been foreseen, as if it fitted in the original plan of procedure. It is a fact that "rests in the air," waiting for an explanation. The excavator must resist the temptation to neglect what he does not understand. In the second place, the hypothesis should remain tentative until facts confirm or nullify it. It is a simple method of forcing the monuments and sites to yield their secrets, a method of asking questions; and it is necessary to be silent from the moment the monuments speak, to listen to their answers — to listen to the very end, and in all cases to submit to their decisions.



TWO VIEWS OF THE RESTORED GROUND-PLAN OF THE TEMPLES AND PALACE OF QATNA (BETWEEN 2000 AND 1375 B. C.): 2, THE TEMPLE OF NIN-EGAL; 11, THE GREAT ANTE-CHAMBER OF THE PALACE; 14, THE THRONE-ROOM.

One must never reply for them, nor take only those facts for true which favor or confirm the hypothesis. There is here a question of professional honesty and intellectual discipline.

There are excavators who after a hurried examination, are guided by some preconceived idea which seems to them logical and reasonable, and endeavor to verify this idea by their observations. This is what a great historian and philosopher, Fustel de Coulanges, has to say of such procedure: "Instead of studying the object itself for what it is, you bring to it your personal conclusions. You think that you are studying the object, but you are looking only at your own concept of it, and you are dominated by this concept to the extent of seeing nothing but this, and of seeing it everywhere. *This is the greatest source of error in history.* There are minds which for this very reason are incapable of ever seeing the truth."

One can summarize the following relative positions of observation and hypothesis. While conducting his searches, the excavator gives free course to his reason and creative imagination. As soon as he has made a find, he concentrates all his attention on the exterior evidences, to grasp them to the least detail, and to record them in their entirety, with complete self-effacement. When he is in possession of definite facts that have been carefully recorded, he again has the right to construct by hypothesis a provisory system for verifying the facts by comparison. He instantaneously has to change from the active attitude of the investigator to the passive attitude of the observer, and then to return to the former, in order to introduce into his experimental reasoning the newly discovered facts. In the course of an excavation, the role of investigator and observer often overlap. An effort to separate them, however, is useful and profitable. It is necessary to tell oneself from time to time, for instance when one removes a stone that closes the entrance to a tomb: "At this moment, I must forget all my theories, all my hypotheses, and make myself a recorder of facts; it is a question of seeing well, of seeing all, but not of constructing." It has sometimes been said that ignorance is the best background for making discoveries. This would suggest that it is better to record on fresh, though unprepared wax, than on material that is finer, but deeply grooved. I repeat, the most fatal error for an excavator is to have *fixed ideas,* clinging to theories for which he but seeks the confirmation.

Here is an example of a successful hypothesis that was well-considered, and that led to a chain of closely connected observations. M. Flinders Petrie noticed in the course of his excavations, that certain measurements in temples or palaces repeated themselves exactly, and that others existed as various multiples of these, or, if you wish, it may be said that certain lengths were divisible by the same number. He asked himself whether he had here merely coincidence, or the result of some unknown principle. He realized that if a fixed unit had served as a standard for the architects and mechanics of the edifices, it must without doubt have been based on the most frequently occurring

HIGH PLACE OR CHAPEL OF THE GODS OF THE KING OF QATNA, WITH CUP-CHISELLED ALTAR. THE PLACE OF THE GODS IS IN THE FORE-GROUND. IN THE HOLE AT THE LEFT, THE BASE OF THE SACRED STAFF REPRESENTING THE GODDESS ASHERA IS STILL IN PLACE. ABOUT 2000 B. C.

measurements, as for instance, the cubits indicated by Ezekiel in the measurements of the temple of Jerusalem. M. Flinders Petrie then made numerous measurements, at about 1 m/m, on all the monuments he had discovered as well as on a great number of other edifices, and established that by perfecting the method a little, one could indeed determine the local standards or units of measurement, through divisions of the various lengths recorded. I must add that this important statement, outlined in detail by M. Flinders Petrie in his book *Instructive Metrology*, has led the author to most extraordinary comparisons. For example, two measurements were found to be exactly the same in the Orient and in Central America. Of course, it is most important to be extremely careful in drawing conclusions from a fact that may have no other reason than the identity of the measurements of the body, which is the universal standard. But after all, the method is interesting and instructive.

In order to better group these various ideas or fundamental principles of the art of excavation, permit me to synthesize this study in a simple table, which may be useful to all those who, as ourselves, seek to draw truth, not "out of a well," but out of the trenches of excavation.

Successive operations	Intellectual dispositions	Knowledge
To discover and To see	No preconceived ideas Tenacity	Technique of excavation and the methods of observation. Technique of the arts and the professions.
To record	Ingenuity	Photography, molding, drafting, topography, etc.; style
Hypotheses and demonstrations	Creative imagination and experimentation	History, archaeology, folklore; natural sciences