

The arrival and erection of the Alexandrine obelisk among us may produce very notable results in regard to our knowledge of ancient Egyptian history, and connected as it is with our Bible. The old Greeks and Romans, the classics of our boyhood, have had their annals duly chronicled and reduced to elaborate histories by the learned. These, it is true, have been turned upside down by recent erudite inquiries, substituting a different and new chronology and an assumed rational statement of facts. Egypt till very recently had no consecutive accepted history in our language, that I know of, until our learned Dr. Birch, of the British Museum, compiled for the Christian Knowledge Society his summary of the ancient history of Egypt from the monuments (one of a series), putting together with vast knowledge and most critical acumen an admirable history. There cannot be a doubt that our countrymen, as they pass by our obelisk, will have their curiosity excited by the sight of hieroglyphs which may have been seen and read by the Jews at the time of Moses or when our Saviour was taken by his parents to Egypt as a place of refuge from Herod's rage. They will seek in Dr. Birch's book the solution of the mysteries revealed in those enigmatical sculptures and the history of that ancient people.

ON BLEACHING SHELLAC.

By JOSEF MARIA EDER.

THE greater part of the colorless shellac which is used is bleached in the alcohol solution, because these varnishes give a good polish, and warrant that the metallic articles covered with them will remain bright. There are, however, in the market considerable quantities of solid bleached shellac, and its practical preparation is not unimportant.

The method of bleaching with alcohol and chloride of lime, given by Field in the *Polytechnisches Notizblatt* (1852, li., p. 23), and by Wittstein in *Dingler's Journal* (1857, cxiii., 467), as well as those of Lunning and Elsner, with alcohol and animal charcoal, are not applicable to solid shellac, owing to the high price of alcohol and the difficulty of its recovery. Kressler's method is more practical, in which the shellac is dissolved in aqueous soda solution, and bleached with hypochlorite of soda. Sauerwein modified Kressler's process by the addition of sulphite of soda to the above named reagents.

According to my experiments, the following process is practically especially to be recommended, and can also be carried out on a large scale, according to my directions:

Ten parts of pulverized shellac dissolved with four parts of crystallized soda in 120 to 150 parts of hot water in a copper kettle, and the violet solution, the color of which is due, according to Marquart and Nees Von Esenbeck, to a coloring substance similar to carmine, is filtered through linen into a wooden vat. Ten parts of chloride of lime (containing about 30 per cent. chlorine) is triturated with a solution of 10 to 20 parts of crystallized soda in 200 of water, and this bleaching solution filtered into the shellac solution. To the mixture, when cold, dilute hydrochloric acid is added carefully until some shellac begins to separate in crumbs: in most cases only a very little acid is required. This little dose—suggested by Sauerwein, in fact—hastens the bleaching in no small degree. After two or three days, whether the solution is kept in the dark or in the light, the bleaching is finished. The shellac is then precipitated by the addition of concentrated hydrochloric acid.

If a comparatively pure natural shellac is to be bleached, this white crumbly precipitate is at once collected upon coarse linen, thoroughly washed with frequent stirring, and then melted together. Impure shellac is left standing for several hours in the liquid, after having been precipitated with hydrochloric acid. The liberated chlorine acts very energetically; yet it is preferable to allow the bleaching to proceed in the alkaline solution. The finely divided shellac, if it remains very long in the acid chlorinesolution, becomes brittle, and cannot be drawn out so well. Inferior grades of bleached shellac are obtained by using half the quantity of chloride of lime above prescribed.

The precipitated shellac is put into boiling water, when it becomes soft, and can be moulded in any desired form. At first it is porous and not transparent, but repeated warming, and strong kneading and pulling, impart to it a beautiful silky gloss. In spite of the greatest cleanliness, which is absolutely necessary, it is scarcely possible to prevent the surface becoming yellowish; if the bleaching does not succeed perfectly, the whole mass has a yellowish shade. To improve the appearance of the ware, the drawn and moulded shellac is put for some twenty-four hours in the acid chlorine liquid, from which the precipitated shellac has been strained out. It is used before being diluted by the wash water: if necessary some more chloride of lime is added. By this means a chalk white surface is obtained. This white layer also possesses this advantage, that the shellac can be kept a long time without changing its appearance; for it does not change, as all bleached shellac will, and that, too, throughout the whole mass. Finally, the silky luster is greatly enhanced by brushing the surface. This silky appearance cannot be obtained by chemical means. According to Berzelius, by a short immersion in strong ammonia the surface swells, and when dry has a strong luster, but instead of being silky it is resinous. The white color of product changes under this treatment to yellowish, and cannot be restored by the above mentioned process of after-bleaching.

The shellac thus prepared dissolves rapidly in alcohol, and the solution is perfectly colorless. Previous swelling of the shellac in ether is superfluous. With freshly bleached shellac a milky turbid varnish is frequently obtained, which does not clear on standing a long time, as observed by Jacobsen and Peltz. The cause of this is the insolubility in alcohol of a resin which is contaminated in the crude shellac, as shown by Unverdorben (*Pogg. Annalen*, xlv., 119), and by the wax in the shellac (*Ann. Pharm.*, cxxxi., 286). The method proposed by Peltz, of extracting this substance with petroleum ether, I do not consider commendable, for the reason that such varnish dries brittle. Shaking the solution with pulverized chalk, or gypsum, accomplishes the clarification in a few hours, and the clear solution can readily be drawn off—*Dingler's Journal*.

PLASTER CASTS OF FISH.

FISH are taken as fresh and perfect as possible, wiped with a cloth, not only to dry the moisture, but to remove the mucous secretions. The fish is then laid on a flat smooth board, and placed in a natural position by means of little lumps or wedges of potter's clay, raising the parts liable to drop below the axis of the fish. The fins are spread out upon flat cushions made of potter's clay, and are kept in their spread position by means of pins. When the fish has

been firmly set in a natural position a rather thin mixture of plaster of Paris and water is poured over the fish, and repeated coatings of this material are applied until a sufficient thickness is attained, when it is allowed to set moderately hard. The mould is now turned over and the fish removed. When the cast is made, a slight coating of shellac varnish is applied throughout the inside of the mould. The plaster of Paris mixture is then poured in, and when sufficiently "set" the mould is chiseled away, the shellac coat guiding the workman as to the depth it is safe to cut. The cast is now trimmed of its rough edges and projections, and a square stiff frame having been made, with the inner edges studded with nails, the cast is placed within it, lying on a flat table, and plaster of Paris is then poured within the frame until it rises to the level of the edges. Embracing the base of the cast, it also adheres firmly to the inside of the frame, and when "set" is lifted from the table. The plaster matrix, which now becomes the back of the fish, is smoothed. The plaster cast is now ready for coloring.

NEW PHOTO-PLATE PROCESS.

At a recent meeting of the Société Photographique, M. Poitevin made a very interesting communication on a property of gelatine, rendered insoluble by heating with iron perchloride and tartaric acid, of becoming again soluble after a sufficiently long exposure under a photographic negative. He has also experimented on and proved the possibility of obtaining a print in fatty ink on polished glass coated only with a dry film of iron perchloride and tartaric acid, or on gelatine previously rendered insoluble, the ink adhering only to those parts which have not been insolated. The solvent penetrates from the surface inward, and by adding an inert or grainy substance to the gelatine the required kind of grain for impressing ink or soft metal plates is easily obtained.

M. Poitevin avails himself of the newly-discovered property of gelatine films which have been rendered insoluble by perchloride of iron and tartaric acid to obtain directly from a negative, by means of a fatty ink, positive prints which can either be transferred to a lithographic stone, or to a zinc plate, from which an impression can be taken by the printing-press, or which can be rendered in relief by the recognized methods of typography. This property consists in the fact that gelatine made insoluble by iron perchloride and tartaric acid, and not again rendered soluble by exposure to light beneath a photographic negative, will once more become exceedingly soluble in warm and slightly acid water, either after the image has been developed or when it has been previously treated with a weak solution of hydrochloric acid.

The process adopted by M. Poitevin for producing, in this novel way, pictures in fatty ink, is as follows:—The paper is coated on one side only with gelatine, slightly colored in order that the progress of the operation may be better observed, and floated with both ends successively on a bath prepared by dissolving—

Iron perchloride	10 parts.
Tartaric acid.....	3 "
Water.....	100 "

Or the paper may be dipped entirely in the bath for some minutes. It is then hung up by one corner in the dark to dry. When it is dry, it is exposed to the sunlight under a negative of which a print is to be reproduced. The printed film is next treated with warm water, which dissolves out all the parts that have been affected by light; thus is obtained a reversed negative print of the object, since all the transparent parts of the negative are represented on it by the white of the paper, where it has been bared of gelatine. By means of a roller, or of a pad, or, still better, of the press, the surface of this print is then coated with a film of ink, and plunged in water slightly acidulated; it can also be next treated with acid water, which dissolves the gelatine where it still remains on the white parts, while that which is in direct contact with the paper remains adherent to it, and forms a positive picture in fatty ink which can be transferred to the stone or the zinc. M. Boivin, M. Poitevin's fellow-worker, in experimenting with this new process, has obtained by its means excellent results.

DRY-PLATE PRIZE.

THE following are the conditions prepared by a committee of the London Photographic Society, consisting of Messrs. W. England, Sebastian Davis, and Wm. Bedford, and sanctioned by Mr. Paget, the donor of the prize, for the guidance of competitors for the prize of £50 offered for the best dry plate process:

"1. The description of each process accepted in competition shall contain sufficiently accurate details to enable any ordinarily skillful photographer to produce results thereby equal to those obtainable by the wet collodion process.

"2. Sensitive films made by the process shall remain without perceptible change for not less than four months after preparation, and must keep satisfactorily three months in any climate between exposure and development. Should more processes than one fulfill the stated conditions, the preference will be given to the most sensitive and easily prepared.

"3. Each competitor or his representative shall have the option and be willing, if required, to prepare any special chemicals or appliances, and, with such or others prepared according to his formulæ, make, expose, and develop some negatives by his process, in the presence of the appointed judges.

"4. A description of the processes shall be sent to the secretary of an award committee, to be appointed by the Council of the Photographic Society of Great Britain (competitors not being eligible to act thereon), on or before the 31st March, 1879, accompanied with three 8½ by 6½ unexposed plates, and two or more finished negatives. Should the negatives not be equal in the opinion of the judges to those produced by the wet collodion process, they, together with the unexposed films, and descriptions of the means by which they have been produced, will be returned on or before the last day of May, 1879. Competitors may send the negatives, etc., accompanied with their names and addresses inclosed in a sealed envelope, and marked outside with a cipher and an address, which will be returned unopened should the award committee consider the specimen negatives below the requisite standard of excellence. One or more of the negatives by the successful process shall be retained for exhibition until after the next meeting of the Society.

"5. The decision of the committee appointed by the Council of the Photographic Society shall be accepted by the competitors as final, and the receipt of the prize shall be deemed equivalent to an agreement that the process may

afterward be published unconditionally, and practiced by any one. Should the conditions not be entirely realized, the prize may be either awarded or retained for competition during the following year, at the discretion of the judges. After the award the description of the prize and other processes may be published under the direction of the judges, unless a wish be expressed to the contrary at the time of sending in a process for competition, should it not prove the successful one."

MECHANICAL AIDS TO HUMAN LOCOMOTION.

WE have been favored recently with several discussions by correspondents on the subject of animal mechanism, the particular topic being the advantages gained by the use of the velocipede in traveling. Several writers virtually take the position that as by no merely mechanical contrivance can energy be augmented, therefore a man can in a given period certainly gain nothing by sitting astride a bicycle and propelling himself; and they further hold that it is an error to assert that there is any real advantage to be secured by the velocipede over simple progression afoot. This question, it will be evident, brings in the whole subject of human locomotion and the means whereby the same is assisted—and these means are the velocipede, the skate (ice or roller), the snow shoe, the oar, and the stilt. By any of these mechanical devices, in connection with himself as the motor, a man can propel himself from place to place with greater rapidity than he can do the same by means of his unaided members.

In England recently a distance of 20 miles was traveled on a velocipede in a few seconds less than an hour. Cases are on record where a man has skated 1½ mile in 3 minutes and 6 seconds. Snow shoe traveling has been done at the rate of 4 miles in 24 minutes and 6 seconds; and it has been estimated that in rowing a boat 1 mile in 7 minutes, the oarsman performs the labor of 6 fully worked laborers at ordinary occupations of 10 hours. As it is manifestly impossible for the human body, without mechanical aid, to accomplish any of the above feats, the question arises of how does the oar, the bicycle, the snow shoe, the skate, or the stilt augment the capabilities of the human machine.

The general signification of the word "work" is the overcoming of resistance. The accepted unit of work is the raising of one pound of matter one foot high, the resistance being the attraction of gravitation. Motion is not work, neither is the weight of one pound drawn horizontally the unit of work, unless frictional resistance should happen to equal the weight. When we speak of power, time becomes a necessary element, and the unit of power refers to a certain weight raised a certain distance in a certain time.

The human body as a machine is the most perfect mechanical contrivance ever made. Not only does it convert a far greater portion of the energy evolved into mechanical work, but it distributes this work over a great multiplicity of objects. For present purposes we are to consider only muscular work, which may be conveniently divided into two classes, namely, the work of muscles governed and those not governed by the will. The last include the beating of the heart and other movements absolutely necessary to life, and hence, providentially, placed beyond our control. The first may be again subdivided into voluntary and semi-voluntary actions. Voluntary action is that which results immediately from exercise of the will, as the movement of the hand in writing. Semi-voluntary action is the result partly of natural instinct, partly of education. In higher animals the latter element enters to a greater degree than in those of lower orders. A chicken shortly after being hatched will run around; an infant must be taught to walk, and its command over the muscles which keep its body erect, at first the direct result of the will, as age advances continues with little or no exercise of will power. The labor of the muscles in sustaining the body in any position is therefore one form of muscular work; that of changing the body or any of its members from one position to another is a second form. Exhaustion results from an overplus of either. It is impossible, for example, to hold the arm extended horizontally beyond a limited number of minutes. Severe fatigue follows standing in one position for a few hours; and generally it may be noticed, as a curious fact peculiar to all organisms possessing locomotive powers, that constant change of position is necessary to their well-being, and that in reality they never rest. Rest with them, as in all nature, is merely a relative term. Locomotion is as resting to the body fatigued with remaining sedentary as the converse.

In realizing, therefore, that two kinds of work are always in progress, it follows that the element of time is a most important consideration, because exhaustion has reference to the time in which the muscles are acting, as well as to the intensity of the force exerted. It is obvious, consequently, that to diminish either is to decrease the work necessary for a given object, and that there may be often a great saving of power in doing work quickly, although with a little more exertion during the time. If two men of equal weight ascend the same stair, one taking but a minute to reach the top and the other four minutes, it will cost the first but a little more than the fourth part of the fatigue which it costs the second, because the time in which the muscles are acting is shortened. For this reason horses are sometimes spared by being made to trot quickly up a short hill and being then allowed to go more slowly, so as to rest at the top.

It will be evident now that this saving of strength by reducing time has a direct bearing upon the question of animal locomotion with which we set out. This will be clearer when we consider that passage over space is the end in view, and that, if we undertake to reduce time by increasing velocity, the space traversed augments not directly as the latter, but as its square. A rifle ball shot vertically up with a velocity of 120 feet a second will not reach three times but nine times as far as with a velocity of 40 feet a second. Mechanical means, therefore, which augment velocity are those which are strength saving as aids to locomotion.

In the velocipede the large muscles of the thighs and those which connect the thighs with the trunk are chiefly brought into action to rotate a wheel of large diameter, which traverses a great space of ground in a short time. By means of the skate and snow shoe the friction between the surface of the foot and the ice is so far reduced that the energy required to swing the leg forward is sufficient to carry the whole body ahead for a distance very much in excess of that passed over by the ordinary step. The velocity is thus greatly augmented, and consequently so is the distance traversed. The oar, by its length and leverage, enables increased velocity to be gained; so does the stilt by its augmentation of the swing of the leg pendulum.

Man, as he now is, is the product of evolution; to ask why he is not otherwise than he is, is simply to ask why his environment and descent were not different, and to question the working of the Unknowable.