Correspondence.

"Cyclone" or "Tornado."

To the Editor of the Scientific American:

In your current number appears an article criticising my description of a storm disaster in Minnesota, in which the writer takes exception to my use of the word "cyclone," and makes the statement: "It should be scarcely necessary to say that a cyclone is not a tornado, but is one of those widely distributed circular storms which are constantly sweeping over the earth's surface."

Permit me to say that I used the word "cyclone" advisedly, and not without a clear definition of its meaning as differing from other storms. The generally accepted definition of the word as given in the dictionary and encyclopedia is "a violent storm of wind rotating around a calm center." While no meteorologist or other expert observer witnessed the one at St. Charles, its cyclonic character was marked in several distinct ways. At the same time it could be termed a tornado as well, since, according to the same authorities, it is a form of cyclone, only on a more limited scale.

The critic takes the ground that a part of the damage was probably caused by air pressure from the interior of the buildings, and gives an interesting theory in support of his argument. I referred to this in describing the wreck of the grain elevator. Here the downward suction of the air current apparently produced a centrifugal motion, which removed or forced out most of the grain. The cause of the damage, however, was the storm of air current, which by its force doubtless in several instances caused what might be termed interior atmospheric explosions, causing partial vacuum without. Day Allen Willey.

Baltimore, Md., September 8, 1904.

Effect of the Sun on the Black Race.

To the Editor of the Scientific American:

As regards the "effects of the sun upon the black race," as discussed by Prof. E. G. Dexter in the Scientific American, August 20, he has, in my estimation, overlooked a very important factor, which is found in the laws of evaporation.

In *prima facie*, Prof. Dexter's argument seems well founded, viz., that a heat-absorbing complexion should for the reasons given be placed by compensative Nature in cold climates, and *vice versa*. When we come to study this subject more deeply we find that though a black skin may serve to elevate the normal temperature of the body in the already overheated tropics, the inconvenience so caused would not be near so great as that caused by the evaporation of the body's moisture, which must necessarily rob the latter of its nervous heat. Whatever physical distress or loss of energy may be due to tropical heat seems explainable as follows: In the first place, since the humid atmosphere causes profuse perspiration, the temperature of the body will be lowered very much, so that a greater difference must exist between itself and the surrounding air or sun. This condition gives rise to the nervous sensation of "burning," but it is really a delusion, for the body is not at all overheated. Nevertheless, it would be unjust to say that because the body temperature is low, the nerves are not actually burning. Forsooth, their stimulus is absorbed by water-evaporating skin more rapidly than it can be replenished. And this causes the lassitude with which we are so familiar.

Wise Nature, being aware of these difficulties, seems to show its foresight by not only salting the sweat to decrease its volatility, but it so colors the skin in the tropics that much of the heat required by the inevitable laws of evaporation is abstracted from the sun instead of the body. Albert F. Shore.

Brooklyn, N. Y., August 20, 1904.

Lessons of a Railway Wreck.

To the Editor of the Scientific American:

There are some possible lessons in connection with the disastrous wreck which occurred on the Southern Railway near here last Saturday which may not be noticed farther away, where the details are not so well known. The west-bound train consisted of a light engine and three ordinary coaches, running at a rate estimated at 40 to 50 miles an hour; the east-bound one had a much heavier engine, drawing a mail and baggage car, two day coaches and three Pullmans, the latter, as usual, being on the rear end. It was running about 30 miles an hour. Of the 60 or more persons killed, all were on the east-bound train, except the engineer and fireman of the west-bound. Not a person in the Pullmans was seriously injured. It would seem that when the light train struck the heavy one it was simply thrown to one side (the meeting was on a curve), throwing the cars about in a way dangerous to life and limb, but not crushing them more than would be the natural consequence of throwing them about so. On the other hand, the force of the blow stopped the heavy engine of the east-bound train, while the three heavy Pullmans in the rear came on with a force which crushed the four cars ahead of them as though they were but chicken coops. With an immovable engine ahead and such tremendous energy coming on behind, it came near being an exemplification of the irresistible force striking an immovable body, with those cars serving as a buffer. The fate of the buffer in such cases may be imagined when it is remembered that from one of these coaches only two persons are known to have escaped alive.

Orders will be forgotten or disregarded as long as trains are run by mere human beings, and so there will be no end of collisions. The public has long known, and if I mistake not the Scientific American has pointed out, that the Pullman car is the safest on the train, usually escaping except from rear-end collisions, and then suffering little if any worse than the lighter coaches before them. Those who can afford them will continue to ride in them, for the added safety as well as comfort; but may not the day come when that part of the public that travels on a cheaper scale will demand that railroad companies cease to make a buffer of it to place between the obstructions on the track and its high-priced traffic riding in the bomb-proof Pullmans? W. C. Clark.

Rutledge, Tenn., September 29, 1904.

The Black Race.

To the Editor of the Scientific American:

In your issue of August 20, Prof. E. G. Dexter asks why the black races have been "placed" in the tropics where they are most affected by the sun's rays, instead of near the poles, and he seems to look to some other science than physics for an answer to this query.

According to the now generally-accepted theory, pigmentation is produced by the sun's rays or rather by the heat produced by the sun. Now, geology teaches that our earth was a very hot place when organic life first made its appearance upon its surface, and there is every reason to suppose that man appeared upon earth at a period when the coolest place upon it (where man undoubtedly first made his appearance) was a great deal hotter than the hottest place at the present time. Consequently, the first human race must have been a black race (which, however, is far from saying that it was a negro race)—blacker, perhaps, than any race now existing. The bleaching process which has been going on through the ages, is in strict conformity both with the law referred to by Prof. Dexter, namely, that a white surface absorbs less heat from the sun than a dark surface, and the well-known fact that not only the human skin is fairer in cold climates than in warm climates, but even animals and birds have lighter covering in the former than in the latter; for as animal life first made its appearance in a higher temperature than that under which it now exists, the phenomenon under discussion is in strict accordance with the law of adaptation to the environment, and not a contradiction "between a fact in nature and a natural law," as the professor seems to think, erroneously assuming that sunlight is an "evil" even in the tropics, the fact being that it is the greatest blessing nature has bestowed upon our planet, and without which organic or animal life could not exist.

Pigmentation, then, may be explained as Nature's effort to absorb as much as possible of the greatest of all earthly blessings, and the loss of it, as the accentuation of the evil resulting from yielding too readily to conditions which tend to deprive one of it. The black man has "placed" himself in tropical countries because life there is sustained by the minimum of effort, the least expenditure of energy, while the loss of pigmentation and consequent decrease in the absorption of heat resulting from living under a lower temperature is Nature's way of warning man not to expend energy too fast by seeking his abode where less sunlight and heat makes life more strenuous and exhausting. When the majority of the human race have chosen or have been forced to live under such conditions, the increased struggle for existence has indeed brought them the blessings of civilization; but the development of intellect resulting from this struggle has generally been at the expense of the physical perfection—health and strength, if not beauty—enjoyed by black races.

Except for the constant infusion of dark blood into the white race, thus retarding the bleaching process, this race must long ago have become extinct.

The professor is right in intimating that one science should corroborate the truths discovered by another, and if he will dip a little more deeply into other sciences than his own specialty, he will find that there is not even "a seeming contradiction between a fact in nature and a natural law," though the above brief explanation of the object of pigmentation in the black races may not at first glance seem satisfactory.

Chicago, Ill., August 22, 1904. O. M. Peterson.

Kapok and Its Uses.

Chambers's Journal contains the following:

Every year that busy center of commerce, Amsterdam, receives nearly 1,000 pounds' weight of a curious and interesting vegetable substance known in Java and in the trade as kapok, which is found very useful for stuffing cheap mattresses and pillows, among other purposes. It is a sort of yellow wadding which nature uses as a covering for the seeds of certain trees in the Malaccas. Its fibers being very non-resisting, it has been found impossible to spin or weave it, but it gives excellent results for bedding, making a mattress delightfully soft if it is exposed to the sun before being used. It is exceedingly light and buoyant, in this respect greatly surpassing cork, as it will support in the water thirty-five times its own weight. The tree whence it is derived (*Eriodendron*) grows rapidly, and in the second year is 12 to 15 feet high, but it does not fruit abundantly until the fourth year. Like the cotton plant, it bestows two gifts on man—the special wadding mentioned, which lines the husk, and the oil extracted from the seeds, which is used especially in the Chinese markets. The threads of the soft fiber taken from the pods are light yellow, rather silky, and only about an inch in length. They are made into thin rings. Kapok, it is said, never decays. Among the ever-increasing uses to which this curious vegetable product is put—causing the culture of the Eriodendron to make great strides in the Dutch Indies, while efforts are being made to cultivate it in similar climates—it has been suggested that excellent life-saving apparatus might be made from it, which should be in the form of mattresses and cushions, easily obtainable in moments of danger. Three hundred grammes of kapok (10½ ounces) will support a man of 10 stone 5 pounds (145 pounds) in the water; and experiments by a French society with articles made of this wadding, which had previously been soaked in water for eighteen hours, gave excellent results. One small mattress supported several men. It is probable that soon all ships' beds will be made of kapok.

The Current Supplement.

The Eighth International Geographic Congress forms the first-page illustration, and some interesting portraits of distinguished scientists are given. An electrical heating apparatus of a new type and its application to the baking of bread are described. The future historian of the progress of telegraphy and telephony in America must devote much space to the invention of the telegraphic relay. Dr. John Trowbridge discusses the subject in the current Supplement, and seems to think there is a prospect of the relay's practical use in telephoning. Prof. Edward S. Holden, librarian of the United States military academy, contributes a scholarly article on Copernicus. Two articles from the pen of the St. Louis correspondent of the Scientific American are published, the one on the French pavilion and gardens at the fair (an excellent replica of the Grand Trianon at Versailles); the other on the mining exhibits at the fair, describing a typical gold concentrating plant. Prof. Dr. R. von Lendenfeld writes a very thorough article on climate and glaciers. Still another article of meteorological interest is one by Dr. W. N. Shaw, F.R.S., on the "Mechanics of the Atmosphere." Scientifically considered, one of the most important contributions of the current Supplement is the first installation of a splendid article by Prof. E. Rutherford on the "Radiation and Emanation of Radium." The article considers the subject in the light of the most recent research and describes experiments made with radium.

In Knowledge, Mr. R. Lydekker traces the "Later History of the Horse," and endeavors to decide between the alternative theories of its derivation from those primitive breeds, when, as Mr. Kipling says in the "Just So" stories, the horse followed the dog in becoming the friend of man. There is, says Mr. Lydekker, decisive evidence of the existence in Egypt in 1900 B. C., or earlier, of a long-maned breed of Arab horse totally unlike the wild tarpan or the prehistoric horses familiar to the cave-dwellers of La Madelaine. Such a breed must have been the result either of a long antecedent domestication, or must have been produced from a wild species furnished with a long mane and tail. Probably the former view is correct so far as the development of the mane and tail is concerned, although it is most likely that the breed traces its origin to a species distinct from the tarpan and prehistoric horse of western Europe. That such a breed should have been introduced into Germany and Britain in pre-Cæsarian times—at all events, in such numbers as to obliterate all traces of crossing with the wild horses which abounded in those countries during that period—seems to him in the highest degree improbable; and he therefore cannot at present see any valid reason for refusing to credit the view of Flower that in Palæolithic and Neolithic times the indigenous hog-maned wild horses were domesticated by the aborigines.

THE "CIRE-PERDUE" PROCESS OF BRONZE CASTING.

In very many of the artistic sciences and crafts we in this country are still behind the Europeans. That this is the case is of course easily explained by our comparatively short national life and the fact that the artists and craftsmen of the Old World have been perfecting themselves and developing the processes of their sciences for hundreds and sometimes thousands of years. In the casting of architectural and art bronzes is this generally, and with truth, believed to be the case. It has only been within a few years that we have been able to approach the French, Italian, and Russian bronze work. Even to-day work that can fairly be considered the equal of any done in Europe is accomplished by but few firms in this country; and the success of these companies is entirely due to the introduction of the "cire-perdue" process of making bronze castings. This process, while it has been in use in Europe for hundreds of years, was not introduced in the United States until about a decade ago.

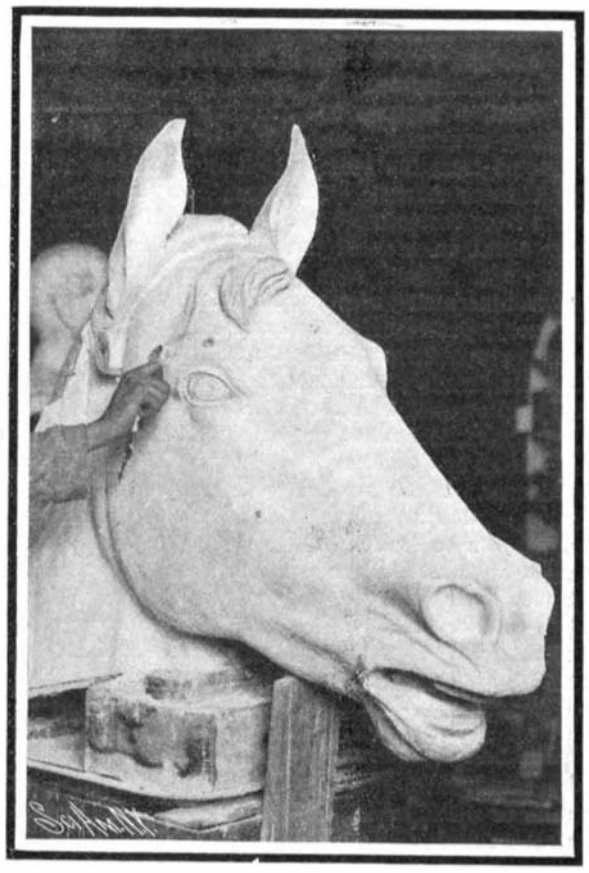
While a similar though much cruder method was in use by the ancient Greeks and Romans, it was developed to essentially its present state by the great Florentine goldsmith and bronze worker, Benvenuto Cellini, about the middle of the sixteenth century and has remained practically unchanged to the present day.

The "cire-perdue" process differs radically from the common or sand casting in several ways, and the latter can in no wise compare with it. Its principal advantage is that no matter how complicated or involved the original may be, the bronze reproduction can be cast in a single piece. This does away with assembling the separately cast bronze pieces, with the consequent inevitable traces of the joining. Further, there is no tamping of sand in the mold, with the danger of destroying detail, and finally, a complete casting takes about half as long to make by this method as by the other.

Though the sculptor usually carries out his conception in clay or wax of the same size as the intended bronze, it is sometimes inconvenient, especially if the statue is to be of heroic size, to do this, and consequently the artist's original is frequently much smaller in size. As, however, full-size plaster casts are necessary in this or any other process of bronze casting, a full-size clay model must be constructed from the small original. The illustrations show the manner in which the whole or the parts of a model are enlarged.

When the original or plaster replica is received from the artist, the first step in the "cire-perdue" process is to make a plaster or gelatine mold or "negative." Within this negative a hollow wax figure or positive is now built up, the wax being applied with a brush till it is of the thickness that the finished bronze is to be. This part of the process, as is easily seen, is analogous to sand molding, and the wax figure must be made in separate pieces whose size and number are determined by their shape; for instance, if a half-closed hand is to be molded, the fingers and the body of the hand would have to be separately reproduced and afterward assembled, as otherwise it would be manifestly impossible to remove the pattern in one piece without destroying the mold. The analogy ceases with the assembling of the separate wax pieces. The complete figure is retouched as much as necessary, and, as the medium is wax, by using heat in the assembling the joints can be absolutely done away with, so that we have an exact wax likeness of the artist's original. A great advantage of this method is that, if he desires to do so, the artist can change or retouch the wax figure as much as he pleases. The wax is sufficiently hard to permit handling, and will take the most delicate impression.

The next step is the making of the final mold for the metal. This is made of a composition, liquid in form, that hardens in a few minutes after its application. This composition is poured around the wax figure and, as can be easily understood, makes as exact a mold as can be produced, and, moreover, entirely without ramming or tamping. At the same time an outer shell of a coarser composition is built up around the mold to give it greater strength. An opening or two is left in the hollow wax figure so that the composition may be poured into it to form the inside core. Bronze rods are driven through the wax at several places, projecting on the inside as well as



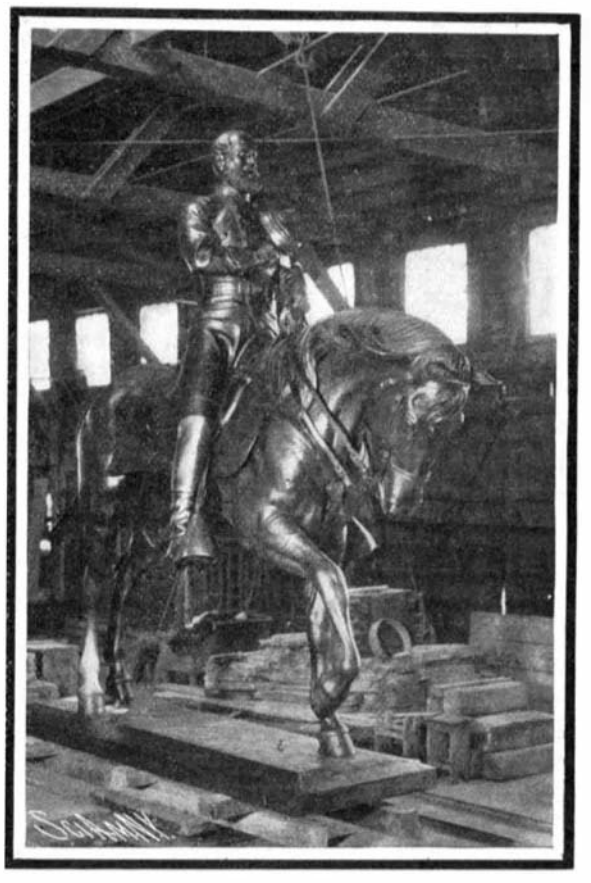
Retouching Plaster Model.

Finishing Model of General Porter.

Putting on Channels, Gates, and Cores.

Sand Molding.

Completely Assembled Wax Positive or Pattern.



Finished Bronze.

THE "CIRE-PERDUE" PROCESS OF BRONZE CASTING.