shores of this thoroughfare are low, that intervening between it and the St. John being a mere marsh subject to overflow by the spring freshets; and it is in the soft muds forming the bank of the stream, and thus annually submerged, that the relics in question are obtained.

These are in the form of broken fragments of pottery, of which the largest obtained by me was about two by two and a half inches, and, although not sufficiently perfect to give any definite idea of the form or size of the vessels of which they once formed a part, reveal very clearly, by their composition, texture, and ornamentation, their true nature. As a rule, they are quite firm, looking as if made up of a granular admixture of clay and fine sand, through which, in many specimens, are scattered numerous and rather conspicuous fragments of a lustrous black mica; the whole being hardened, if not vitrified, by heat. The outer surface is usually covered with a reddish or dark-brown glaze, which is less coarse than the material beneath; and upon this surface are stamped or impressed numerous indentations variously arranged in series of parallel, forking, or decussating lines. In one instance only could any thing like definite form be recognized; this being a well-rounded rim, or margin, striped on either side, of what appears to have been a shallow hemispherical bowl, or basin, of some six inches in diameter. During the extreme low water of summer, such fragments may be readily obtained lying on the surface of the hardened mud-beds, but at other times are to be had only by wading.

With these remains of ancient pottery has been found a great variety of stone implements, some of exceptionally perfect design and workmanship, and in two instances elaborately ornamented; while at short distances along the shore, and laid bare by the ploughing action of the ice in spring, are small heaps of flint-chips of all shapes and sizes, with, not unfrequently, broken pebbles or bowlders of quartz from which these have been derived.

The locality is one eminently fitted by its position for the temporary or permanent occupation of the aboriginal tribes, giving easy access by water not only to the St. John River, but to an extensive lake-region, which must have abounded then, as it still does, in game of various descriptions. It has, indeed, been a favorite camping-ground with the natives ever since the time of the first settlement of the country by the Europeans. A curious instance of the contact of the two races has been observed in the finding, during the ploughing of a field, several feet below the surface and not far from the thoroughfare above described, of a large copper caldron, or kettle, evidently of French manufacture, but containing within, besides a quantity of moose-hide, a variety of colored glass beads, some arrow-heads, and a single human molar tooth.

L. W. BAILEY.

Fredericton, N.B., March 4, 1883.

THE PROPERTIES OF CARDIAC MUSCLE, AND THE NATURE OF THE ACTION OF THE VAGUS NERVE UPON THE HEART.

WE printed recently (SCIENCE, No. 2) an account of the researches of Engelmann upon the rhythmic properties of cardiac muscular tissue. Almost simultaneously with the appearance of Engelmann's paper, Gaskell read before the Cambridge (Eng.) philosophical society a communication on the same subject, which has since been published in the proceedings of the society (vol. iv. 277, 1882). Gaskell independently arrives at the same general conclusion as Engelmann in regard to the rhythmical properties of cardiac muscle, but adds much that is new on this and other points. Researches on the hearts of frogs and tortoises, previously published, had led him to the following conclusions: 1°, The beats of the heart represent peristaltic contractions, which start at the venous sinus, and thence travel over the heart; 2°, The peristaltic nature of these contractions is obscured by the fact, that the wave of contraction passes along a tube which is not of the same calibre or of the same properties throughout, consequently the systoles of certain parts (auricles, ventricles) which have bulged out and become prominent, or which by differentiation of structure in the course of development have gained the power of more rapid or forcible contraction, being most conspicuous, give the impression of separate and successive contractions; 3°, Between sinus and auricle, and auricle and ventricle, in these animals, is a connecting band of muscular tissue of feeble contractility and slow conductivity. A systole started in the sinus is thus separated by an apparent interval from the auricular contraction, and this in turn from the ventricular. Gaskell had further proved that one could artificially produce in any region of the heart a zone of slow conductivity, corresponding to the natural sino-auricular or auriculo-ventricular boundaries. If a clamp, for example, be closed not too tightly around the ventricle, then a pause occurs between the contraction of the base and of the apex of that division of the heart. In the tortoise, one then gets, added to the usual succeeding phases of the heart-beat, sinus systole, auricle systole, ventricle systole, — an additional one, due to the separation of the ventricular systole into two distinct contractions, — one of its base, followed, after an interval, by that of the apex. If the clamp be still further tightened, only one contraction of each pair exhibited by the base passes on to the apex of the ventricle; on further tightening, one in three, one in four, and so on, until the block caused by the clamp becomes complete.

The above experiment serving to show how easily, by differences in the conductivity of certain zones of the heart, a primitively continuous peristalsis may be turned into apparently distinct beats of various regions, each separated by an interval from that of the heart-chamber preceding it, the question arises, What is the source of the primitive contraction starting from the venous sinus? Does it lie in nerve-cells, or in the possession by the sinus of muscular fibres, which have a greater tendency than those elsewhere in the heart to exhibit apparently spontaneous rhythmic contractions? Observations on the heart of the tortoise strongly support the latter view, as they show that any section of the heart will, if left to itself, sooner or later contract automatically; the difference in this regard between the venous sinus and the tip of the ventricle is one of degree, and not of kind. The isolated sinus begins beating at once, the auricle a little later, the ventricle later still, and a strip cut out of the tip of the latter only after about four hours. Once the beats in any division commence, they become rapidly more and more regular and powerful, and then continue uniformly for, in some cases, more than twenty-four hours. These facts seem to show that all parts of the tortoise-heart are spontaneously rhythmically contractile, but that the spontaneity is most marked in the sinus, and less and less prominent as the apex of the ventricle is approached. The latter, however, contains no ganglion-cells; and, as we can pass back by gradual steps from its properties to those of the sinus, it seems pretty certain that the systoles of that part are also primarily due to its muscular tissue, and not to the nerve-cells in it. Recent researches seem to show that all contractile tissue has primitively a tendency to contract rhythmically; and we may perhaps regard the phenomena above described as due to a greater retention of this property in the muscle-fibres of the venous sinus of the tortoise-heart, as compared with those of the ventricles, which have been so modified for the purpose of rapid and powerful contraction as to interfere with the manifestation of the fundamentally inherent tendency to exhibit so-called spontaneous rhythmical beats.

The concluding portion of Gaskell's paper is concerned with the action of a weak, interrupted current upon certain functions of the cardiac muscle, and its resemblance to the action of the vagus nerve. He had already proved, so far as the frog is concerned, that stimulation of the vagus might, under various circumstances, produce directly opposite results, which may be arranged in pairs. It may cause, 1°, Slowing or acceleration of the rhythm; 2°, Diminution or increase of the force of the contractions; 3°, Diminution or (possibly) increase of tone. From subsequent work with the tortoise-heart, he now adds, 4°, Diminution or increase of conductivity in the cardiac muscle. As a corollary to the latter, is to be added the influence of vagus stimulation upon sequence of beats in the successive heart-cavities. When an artificial hindrance to conduction in the cardiac muscle (as by clamping) is interposed, vagus stimulation may either entirely check the transmission of the wave of contraction, or may facilitate it; and similarly it may shorten or lengthen the time-intervals between the contractions of successive heart-chambers. The initial effect of vagus stimulation is often to depress some function: its final and most enduring power is to exalt, intensify, and repair that function. It slows rhythm, but its stimulation makes rhythmic beats last longer than they otherwise would. It diminishes at first the force of the contractions, but its ultimate effect is to improve and sustain the contractile force. It may primarily diminish conductive power, yet in the end it completely restores that power. Gaskell concludes that *the vagus is essentially the trophic nerve of the heart.*

All the above results of vagus stimulation are repeated exactly when an interrupted current not powerful enough to cause contractions is sent through an isolated strip of the apex of the ventricle of the heart of the tortoise. Further: atropine applied to this strip prevents the action of the interrupted current upon it, just as this drug prevents the action of the vagus upon the whole heart. Since the strip contains no nerve-cells, the interrupted current must act directly upon the muscular tissue. Hence it is made probable that the vagus nerve also immediately influences the cardiac muscle without any necessary intervention of nerve-cells; and also that atropine exerts its well-known influence upon the heart, not, as has hitherto been generally assumed, by acting upon the ganglia in that organ, but by immediately influencing the properties of its muscular tissue.

H. Newell Martin.

THERMOMETER EXPOSURE.

Some may have been misled by a note on thermometer exposures of the signal-service, which appeared on p. 156 of Science. The subject is by no means so simple as that note would seem to indicate. Results of temperatures observed in the same neighborhood vary greatly. That the heat of a city, caused by the burning of coal for heating and manufacturing purposes, can affect the temperature of the air an appreciable amount, will be seen to be hardly tenable when it is considered that a breeze of five to ten miles per hour (which is a very light one) will entirely remove the air in the city each hour; that the number of flues by which the heated air is carried out is exceedingly small as compared with the whole atmosphere over the city; lastly, that reliable observations taken in the city and adjacent country show that no such effect is noticeable. Of the last, any one can satisfy himself by consulting observations made in Central-Park observatory and the Signal-office in New-York City. Both of these observatories are fitted up with the very best instruments, and the records may be regarded as reliable as any in the country. The observations for 1878 for the first-named station have been published in the annual report of the New-York meteorological observatory, and, for the second station, in the reports of the chief signal-officer for 1878 and 1879. The following figures show maximum and minimum temperatures for each month of 1878: —

1878.	Maximum.		Minimum.	
	Central Park.	Signal-Office.	Central Park.	Signal-Office.
January	51°	51°	7°	9°
February	56°	57°	7°	10°
March	69°	68°	13°	13°
April	76°	75°	42°	40°
May	84°	81°	40°	41°
June	89°	88°	49°	47°
July	94°	94°	63°	61°
August	90°	88°	59°	59°
September	90°	86°	45°	45°
October	80°	78°	39°	39°
November	60°	59°	29°	28°
December	60°	58°	13°	12°
Mean	74.9°	73.6°	33.8°	33.7°

When it is considered that these stations are in such diverse surroundings, with different exposures of instruments, and widely different positions as respects the sea, the above agreements can but appear very remarkable. Abundant similar facts may be easily found. Undoubtedly there are great differences of temperature in the same city or village, due to currents of cold air coming down valleys, differences of exposure of instruments, proximity to large bodies of water, and innumerable other causes exceedingly difficult to guard against. If any one has a doubt as to the uniform results obtained by the signal-service, a glance at the weather-map any day will convince him that isotherms can readily be drawn by using the observations made by the service. If it be claimed that these temperatures on the Atlantic seaboard are too high, it will, at the same time, be seen that this is due in large measure to the proximity of the cities to the sea; and it is necessary to establish the stations there to meet the needs of seafaring men. Experiments are being carried on in England in order to determine the proper manner of exposure of thermometers. Certainly the continental method of placing thermometers at four feet from the ground will hardly give proper temperatures in the spring and autumn in the northern United States so long as there is snow on the ground. What are needed are definite results from careful observations, and not indefinite or general expressions.