PHOTOGRAPHIC NOTES.

Timing the Duration of Flash Lights.—Professor Eder has made some interesting experiments, together with Captain Von Reisinger, for the purpose of timing the duration of the flash produced by various modes of burning the flash powder. He employed a heavy wheel of black wood of about twenty-six inches diameter, which is caused to revolve around its axis by hand. At the center of the wheel a silvered hemisphere of glass was attached, and a similar one at the circumference of the wheel. The latter was caused to revolve at the rate of one revolution a second. At first the image reflected by the hemispheres was focused by means of a candle light, then the room was darkened, the sensitive plate inserted, the lens uncovered, the wheel caused to revolve, and the flash produced. The plate was then developed, and showed a sharp point at the center of the wheel, and a sharp black line extending partly round the circle made by the rim of the wheel. This was the reflected light of the flash, and showed the arc through which the wheel had turned while the flash was produced. If this arc amounts to one-fourth of the circumference, the duration of the exposure has been ¼ second. The results of the experiments are as follows:

Explosive magnesium mixture, 30 parts of perchlorate of potash, 30 parts of chlorate of potash, 40 parts of magnesium powder containing 8 grains of magnesium	$\frac{1}{20}$ to $\frac{1}{30}$ second.
Pure magnesium powder, blown as fast as possible through a glass tube into a spirit flame by means of an India rubber tube held in the mouth, containing 8 grains of magnesium	$\frac{1}{8}$ second.
Pure magnesium powder, burnt in Mr. Von Loehr's flash lamp, 8 grains of magnesium	$\frac{1}{4}$ second.
Pure magnesium powder, burnt by means of Dr. Hesekiel's flash lamp, 4 grains of magnesium	$\frac{1}{13}$ second.
Pure magnesium powder, burnt in Professor Schirm's flash lamp, 4 grains of magnesium	$\frac{1}{4}$ second.

These experiments show that the charges of magnesium powder mixed with chlorate of potash (the so-called explosive mixtures) are much quicker in combustion than those of pure magnesium powder alone. To those operators who have experience in flash light photography this result will not be surprising, but it is well known that the various flash light mixtures in which the magnesium is kept stored in mixture with potassium chlorate, picric acid, or other compounds acting as supporters of combustion, have occasioned serious accidents, so that it is doubtful whether their use is to be recommended generally.—*Mr. H. E. Gunther, in Photo. News.*

A Simple Printing Frame. — *Photographisches Wochenblatt* gives the following directions for making a cheap printing frame, viz., take any old or spoiled glass negative of the proper size, and cut it in two, then paste a strong piece of black muslin over both pieces. When thoroughly dry, this will form a hinge. For use, place the sensitive paper on the negative to be copied in the usual manner, then a piece of blotting paper, after which lay the cut negative, muslin side up, on the paper, and secure the whole with four spring clips or clothes pins, and print in the usual manner.

Over Eighty-one Miles an Hour.

A correspondent of *Engineering* says: Recently, when returning from Edinburgh by the West Coast route, I recorded no less than 6 miles averaging 80 miles an hour. Three miles down Shap were run in exactly 2 minutes 15 seconds, and three more down Grayrigg in precisely the same time. The engine was of the President type, 6 feet 6 inches, coupled drivers, cylinders 17 inches by 24 inches, and the load about ten coaches, or say 120 tons. The line falls 1 in 75 for about 4 miles from Shap Summit, then another 1½ to 2 miles at about 1 in 130, after which there is a rise to Grayrigg Summit, 26½ miles from Lancaster, where begins a fall of about 1 in 120, continuing for 14 or 15 miles. The following are the times as recorded:

Miles from Lancaster.	M. S.	Speed.
37½ Shap Summit (pass)	0 0	..
37	0 33	....
36	1 30	....
35	2 18	75·0
34	3 3	80·0
33	3 47	81·8
32	4 33	78·26
31	5 21	75·0
Slack at Lowgill, apparently for alterations in line.		
23	14 19	....
22	15 8	73·4
21	15 57	73·4
20	16 45	75.0
19		
18	18 17	78 26
17	19 1	81.8
16	19 46	80·0
15	20 32	78·26
14	21 18	78·26
13	22 4	78·26
12	22 52	75.0

I was sitting in a compartment of an eight-wheeled coach weighing about 19 tons. Notwithstanding the extraordinary speed, the absence of oscillation conclusively testified to both the carriage itself and the permanent way being in a state which it would be unhandsome not to describe as perfection.

The Effect of Freezing upon Impurities Contained in Water.

The extent to which ice is used makes its importance in relation to health almost as great as that of water. An idea prevails that ice cannot be impure, from whatever source it is obtained, as it is supposed to "purify itself" in freezing. About all that is thought of is temperature, and as long as ice is cold little else is considered. Here is an error that has been the cause of much mischief, and as the iced drinks are sipped, their refreshing coolness drives away all thought of possible impurities, just as candies are eaten and the quality, of sweetness is all that is desired or considered. Regarding the effect of freezing upon impurities in water the Massachusetts Board of Health has published experiments, as stated by *Public Health*, with seventy-six samples of water and 336 samples of ice from fifty-eight localities. In ice from polluted sources compared with water from the same, the experiments showed: 1. That in the ice the color and salt had been removed. 2. That all but 13 per cent of the other impurities of the water, as shown by chemical analysis, had been removed. 3. The number of bacteria in the cubic centimeter were: For snow (one sample,) 1,246; for clear ice (part of the same cake as above), 6; for clear ice from an unpolluted source, 0. 4. The average of 12 samples from the most polluted sources, 138. The number of bacteria varied much in different parts of the same cake.

From the examinations which have been made, it appears probable that when ice first forms in the surface of a pond or river, a considerable part of the impurity in the water near the surface is entangled in the first inch or less in depth, and that the ice which forms below this first inch contains but a very small percentage of the impurities of the water. If snow falls upon the thin ice, causing it to sink, so that the water from below saturates the snow, it will freeze without purification; or if rain falls upon the snow and freezes, the ice thus formed contains the impurities of the snow and of the rain water, and of whatever else may have settled out of the air. The method often pursued, of flooding the ice of a pond or river by cutting holes through it, gives a layer of ice as impure as the water of which it is formed.

The purifying effect of freezing is greater upon substances in solution than upon those in suspension. This is confirmed by the fact that a large part of the organic matter, one-half or three-quarters, and sometimes more than is found in good ice, is of particles in suspension, and is readily removed by filter paper.

From the average of all the water and ice used for ice supplies, which they have examined, they find: The organic impurities of snow ice (the sum of the ammonias) =69 per cent of the impurities of the water. The organic impurities of all the ice (except snow ice) =12 per cent of the impurities of the water. The organic impurities of clear ice =6 per cent of the impurities of the water. The color of waters was removed by freezing. The salt of the waters was nearly removed by freezing.

Of bacteria there were: 81 per cent as many in snow ice as in the waters; 10 per cent as many in all other ice as in the waters; 2 per cent as many in clear ice as in the waters.

The results obtained lead to the conclusions: That while clear ice from polluted sources may contain so small a percentage of the impurities of the source that it may not be regarded as injurious to the health, the snow ice, or any other, however clear, which may have been obtained by flooding, is likely to contain so large a percentage of the impurities of the source, and with these impurities some of the disease germs which may be in the source, that the board feels bound to warn the public against using ice for domestic purposes that is obtained from a source polluted by sewage beyond that which would be allowable in a drinking water, stream, or pond, and that in general it is much safer to use for drinking water, and for placing in contact with food, that portion of the ice that is clear.

Rats.

Countless swarms of rats periodically make their appearance in the bush country of the South Island, New Zealand. They invariably come in the spring, and apparently periods of about four years intervene between their visits. In a paper published in the new volume of the Transactions and Proceedings of the New Zealand Institute, Mr. Joseph Rutland brings together some interesting notes on the bush rat (*Mus maorium*). In size and general appearance it differs much from the common brown rat. The average weight of full-grown specimens is about 2 ounces. The fur on the upper portions of the body is dark brown, inclining to black; on the lower portions, white or grayish white. The head is shorter, the snout less sharp, and the countenance less fierce than in the brown species. On the open ground bush rats move comparatively slowly, evidently finding much difficulty in surmounting clods and other impediments; hence they are easily taken and destroyed. In running they do not arch the back as much as the brown rat. This awkwardness on the ground is at once exchanged for extreme activity when they climb trees. These they ascend with the nimbleness of flies, running out to the very extremities of the branches with amazing quickness; hence, when pursued, they invariably make for trees if any are within reach. The instinct which impels them to seek safety by leaving the ground is evidently strong. A rat, on being disturbed by a plow, ran for a while before the moving implement, and then up the horse reins, which were dragging along the ground. Another peculiarity of these animals is that when suddenly startled or pursued they cry out with fear, thus betraying their whereabouts, an indiscretion of which the common rat is never guilty.

Mind and Matter in Science.

In whatever department of thought we find it occupied, the very nature of science is hostile to uncertainty. Facts, indeed, are not its constant possession, but its object, nevertheless, is always to know the truth as true beyond possibility of doubt. Nothing, therefore, can, in strict conformity with its character, be received on mere trust. All that is accepted must be capable of proof, and anything that cannot be thus verified, though true it may be, is to science a thing not known. In reference to all such matters, its position is that of the agnostic, properly so-called, not, that is to say, of a mere creedless bigot, but of an expectant and cautious investigator, accepting in belief only that which he has proved. In virtue of this very position, however, the description here given is but a partial one. It applies rather to a purpose than an actual condition. It is a true portrait of exact science only, and it leaves untouched the illustration of that far-reaching principle by which every branch of knowledge is made subject to the law of development and passes through doubts, conjectures, and shrouded truths to the brightness of clear understanding. Science is no exception to this rule. It has its tentative theories, its mutable facts, and provisional acceptances, and its position would be logically untenable if it were to deny to other modes of thought a share in that charitable consideration which allows time for its own conclusions, however crude, to be planned, marred, recast, and slowly matured. The assumption of such a position would indeed be suicidal, for it implies a fatal schism among the forces concerned in philosophic inquiry.

Science and philosophy, it must be remembered, are not contraries. They are merely the obverse and the converse of the same intellectual process, the former objective, the latter subjective as to its rational method. Either may, in the wider acceptation of its meaning, be taken to include the other, and it is only the prominence of one, the physical application of scientific study, which has associated the former with what we call matter, as distinct from spirit or mind, the natural sphere of the latter. However diverse they may seem to be, distinction between mind and matter is, in the present state of our knowledge, impossible. We are as yet without experience or information respecting the separate condition of one or another. At all points matter is instinct with incorporated properties which constitute the law of its being, though whence derived its atoms cannot tell us; and mind, on the other hand, can only confess itself through its physical manifestations. Though we should penetrate if it were possible beyond the earliest known traces of our world, we might still be as far as ever from a solution of the mystery, but at no stage could we expect to pass beyond the age at which these two became united. Everywhere we still find, whether in vital activity or in the buried vestiges of world-old existence, the sure signs of cause and effect. The design may vary, but its evidences are never wanting.

Some, perhaps, may prefer to regard it as the essential possession of matter, and to dignify this with the attributes of a creator. We cannot but think, however, that the very diversity of material forms, and their infinite variation in conformity with some discoverable purpose in each case, mark them out rather as the vehicles of some compelling force implanted in them. That this force is not purposive but fortuitous in its action is incredible. Given a certain stage in the progress of development, circumstance may, indeed, accomplish many modifications, as the laborious genius of Darwin has abundantly proved; but even these are governed by strict limitations, are apt to be transient in character, and are rather differences of degree than alterations in type. The argument for intelligent design is not seriously impaired, in our opinion, by such evidence of a merely material agency, and there is every reason to believe that this view is yearly gaining ground among the more scrupulous thinkers in physical science. It is significant to find an authority like Professor Tyndall, despite his belief in matter and force as primary factors in the production of life, admitting the probable existence of a "power of creation," which he associates with evolution, and proposes to invest with some feeling akin to worship. Professor Huxley's condemnation of materialism as "the most baseless of dogmas" is also—at least constructively—suggestive of a disposition to include within the beliefs of natural science the existence of a supreme directing intelligence.—*Lancet.*