RECENT EXPERIMENTS WITH DIAMONDS.

Diamonds are rather costly objects to subject to destructive experiments on any extended scale, and not many investigators have been favored with the privilege of doing it. Thanks, however, to the liberality of the proprietor of a large diamond-cutting establishment in Amsterdam, a certain M. von Baumhauer has been permitted to make numerous studies of the behavior of these interesting gems when subjected to high temperature under various conditions, thus adding largely to our knowledge of the diamond's nature and properties.

The combustibility of the diamond in oxygen was demonstrated long ago; what the effect of pure heat upon it was remained a matter of doubt. Some experiments seemed to show that at extremely high temperatures the diamond is slowly converted into coke or graphite, an effect observed especially when the gem is subjected to the energetic action of a powerful galvanic battery. In certain experiments, in which Moren and Schrötter raised diamonds to the highest heat of a porcelain furnace, care being taken to prevent contact with air, a slight discoloration of the surface was observed, whether due to heat or imperfect protection against oxygen could not be decided positively. Inclosed in a bit of hard coke, and placed in a plumbago crucible packed with charcoal powder, diamonds operated on by Siemens and Rose withstood, without the least change, the temperature at which cast iron melts. A cut diamond, under similar conditions, subjected to the heat of molten wrought iron for a considerable period of time, was superficially blackened, but otherwise unaffected. By some this experiment has been interpreted as implying the slow conversion of the diamond to graphite at the temperature at which wrought iron melts. It is possible, on the other hand, that the change was due to air in the crucible: indeed probable, in view of the experiments more recently made by M. von Baumhauer.

By an ingenious device, the last named experimenter was able to subject diamonds, surrounded by an atmosphere of dry hydrogen, to a temperature at which both diamond and platinum holder became invisible; but with uncolored diamonds, their transparency and brilliancy were not in the least affected. Heated in contact with air, diamonds were not only blackened, but reduced in weight, showing positive combustion. In oxygen they burned with a vivid incandescence at a temperature below white heat. In a crucible which allowed the combustion to be observed through a sheet of mica, the burning diamond was seen to be surrounded by a white flame, less bright without and tinged with violet on the outer edge. Pure diamonds burned tranquilly, retaining their sharp edges even when so reduced as to be visible with difficulty. Impure specimens snapped and flew.

Burned in an oxyhydrogen flame, capable of melting platinum, diamonds emitted a brilliant light and wasted rapidly, but did not blacken. Heated to a high temperature in an atmosphere of carbonic acid, they were slowly consumed, decomposing the carbonic acid, and combining with its oxygen with loss of weight. Similarly treated in superheated steam, no effect was produced, showing that at white heat the diamond does not decompose water, as might be expected from its affinity for oxygen. In regard to the supposed transformation of the diamond into coke or graphite by means of pure heat, especially by that of a battery of Bunsen elements, M. von Baumhauer is very doubtful. It should not be admitted, he holds, until the effects observed are proved to be not the result of chemical action, produced by foreign matter, or by the transmission of particles of carbon from the charcoal poles to the surface of the diamond.

The effect of heat on colored diamonds is more pronounced, with the exception, perhaps, of gray and yellow ones, which appear to resist such action, the same as the colorless ones. Green diamonds are variously affected. One of a dirty green tint was changed to pale yellow, with a great increase of its transparency; but its brightness remained the same. Another, so green as to be almost black, otherwise retained its brilliancy, but gained in clearness, while its color was changed to violet. A light green gem lost its color entirely, but was otherwise unaffected. Brown diamonds lost most of their color, showing under the microscope a limpid field, scattered with black spots. A diamond almost colorless assumed, under the influence of heat (out of contact with air), a deep rose color, which it retained for a time when kept in the dark. In the light its color faded, but always returned again with heating. A naturally rose colored diamond reversed the phenomena, losing its color with heating, and afterwards gradually regaining it.

PHOTOGRAPHY OF THE INVISIBLE.

The grand moral idea which science continually seeks to impress upon her votaries is, humility of mind; that inestimable virtue whence spring the noblest pleasures of the soul. But how rare it is to find this beautiful quality, even in persons of culture and learning! The great doctors looked upon Galileo with contempt, confined him in prison as a dangerous person, and subjected him to the most ignominious treatment, simply because he presented, for their acceptance, the light of a new idea, which their dull perceptions were unable to appreciate. He affirmed that the sun did not really rise or set, that it was the rotation of the earth that brought day and night alternately upon the earth. But the doctors, like many of the day, proud in their own conceit of knowledge, knew better. "The scriptures tell us," they said, "of the rising and the setting sun; therefore it moves; our own eyes assure us of the fact; the diurnal experience of mankind confirms the truth. Your doctrine, Galileo, is false and dangerous."

It is in this style that some persons, very knowing in their own esteem, reason upon certain subjects. Take "spirit photography" for an example. They allege that spirits are invisible; that an invisible thing cannot be photographed; therefore the so-called spirit photographs are base impostures.

It is not our purpose to dissent from the conclusion here assumed; but we take exception to the premises, which are not in agreement with science. Photographs of some objects that are invisible to the human eye may undoubtedly be produced. The spectrum of solar light is an example, portions of which, totally invisible to the eye, are brought out upon the photographer's plate; and their presence is also demonstrated by other instruments.

The mental effect which we term light is supposed to be produced by the beating of waves of ether against the retina of the eye. These waves enter the eye with an average velocity of about 186,000 miles in a second, the length of the waves being variable, from the one twenty-seven thousandth part of an inch, to one seventy-five thousandth part of an inch. The retina therefore receives many billions of impressions in a second, and it is supposed that it is the difference in the number and velocity of these impressions that produces in the mind the sensations of the colors. If the waves which enter the eye have a much greater or a much less velocity than the limits above stated, they do not, it is supposed, produce the sensation of light; and the objects from which such rays come, although they may really stand before the eye, are, as we say, invisible. But although they do not effect the eye, they may impress the photographic plate, which has no such constitution as the eye.

One of the most successful methods of producing "spirit" photographs is to place, in front of the sensitive plate, within the plate shield, a clear sheet of glass having nothing upon it except a thin positive of the "spirit" that is to be produced on the negative. The portrait of the sitter is taken in the usual manner. The light which enters the camera lens prints the sitter and also the "spirit" which is on the thin positive upon the negative. This is a very convenient method, as it requires no manipulations likely to be detected; and is, we think, the favorite plan practiced by the best spirit photographers. Prints made in this manner pass current among the believers for genuine ghosts of the departed, directly descended from heaven.

But a more new, interesting, and scientific method of producing "spirit" photographs, is as follows: the plain background screen, before which the sitter is placed in order to have his portrait taken, is to be painted beforehand with the form of the desired "spirit," the paint being composed of some fluorescent substance, such as a solution of sulphate of quinine. When this painting dries on the screen, it is invisible to the eye; but it sends out rays that have power to impress the photo plate; and thus the image of the person together with the quinine ghost are simultaneously developed upon the negative. This is a very beautiful and remarkable method.

SCIENCE IN THE KITCHEN.

The student of the social economy of this country will encounter no more remarkable anomaly in the habits of our people than that, while we exhaust every possibility achieved by the progress of modern science toward the augmenting of our pecuniary welfare, we as sedulously neglect the teachings derived from the same source and pointing to one of the most important causes of physical health and comfort. When a man undertakes to build himself a house, it is the general rule that he exercises the closest care that every portion of the structure shall be, in design and material, the best. He employs a capable architect, a thorough builder, selects stone, brick, mortar and other components of his fabric with a rigid scrutiny which leaves no doubt in his mind but that his dwelling will be a strong and lasting shelter. Then he decorates, furnishes, searches for ingenious devices of household convenience, and finally enters his new habitation secure in his belief of its excellence. Is it not strange that all his labor is done for a roof which may cover its owner but until to-morrow: for a home which the vicissitudes of fortune may wrest from him in a day, or which of his own choice he may abandon before the mortar is perfectly dry: while to the structure in which Providence has ordained he shall exist for a lifetime, but secondary consideration is given?

Our food has been compared to the fuel which heats a boiler, makes steam, and so drives the machinery. The simile is not only trite but unjust. The substances that we eat play even a greater part. It is as if the fuel, besides heating the water, contributed by its combustion to the existence of the boiler—in other words, we are made of the materials we consume. Clearly then, although we may subsist for a time on substances unsuitable and comparatively non-nutritious, in the end our physical system will suffer, if not break down, from the improper nature of the components with which it is supplied.

Cooking is the proper preparation of food for human consumption. We do not consider that the term means applying heat until the substance assumes any form which is edible, but the causing of the material to undergo certain changes, chemical or otherwise, in its condition, which render it in the most suitable state for the nourishment of the body. Articles for the table, then, are either cooked or ruined—necessarily one or the other. Bad cooking, like bad grammar, is non-existent *ex vi termini*; but as to where the dividing line happens to be between these very opposite conditions, it is odd that few persons can agree. Perhaps it may be safely drawn from the sanitary point of view, as above noted; for a single material, like the common potato, for example, may be nutritious and healthy when properly cooked; while if it be boiled until it be waterlogged and waxlike, its beneficial nature is lost. Theoretically, then, the gage of cookery should be the healthfulness of its results; practically, however, the standard is simply and purely one of individual taste; and that in this country, where the majority are educated to relish compounds indigestible and worthless as brain and muscle producers, is fallible in the extreme. Hence, while this sense is gratified, we give no thought to the means; in other words, so long as the builder of the fabric is satisfied with the exterior appearance of his stone, mortar, or brick, no matter, if when they are made into a wall, they prove bad within, and weak and insufficient as supports.

Dr. James, in an excellent paper recently read before the American Health Association, upon a topic kindred to that to which we are referring, points out with much clearness many of the abuses into which the preparation of our food has fallen, and inveighs with special vigor against the general assumption that women are natural cooks. Perhaps it is to the invariable inaccuracy which (our feminine readers will pardon us) is inherent to the gentler sex, more than to any other cause, that the science of cookery has descended to the level of a rule of thumb pursuit. Do we ever need a medicine, we watch the druggist, that he compounds it with scrupulous exactitude. Do we build a machine, we hire talent that will execute the work to hair breadth accuracy; in fact, we employ skilled labor to supply us with knowledge, to house us, to dress us, and even to shave us, everything but to feed us. It takes an artist to make our coats: but the most foolish of Hibernian virgins may be installed in our kitchen to prepare the food that makes our body.

If cookery were reduced down to rule, so that a person could follow recipes with the same certainty of success, due to accuracy, with which the student pursues the instructions laid down in his textbook of chemical analysis, it is presumable that any individual could produce eatable and healthy dishes; but nothing is further from the truth. Let the reader ask any successful cook how he or she made such or such a compound, the chances are strongly that no satisfactory explanation can be given. "Practice" is probably stated as the reason, or "experience," or "luck." Let him turn to any so-called cookery book, and we would be willing to wager that in nine cases out of ten the recipes for the most delicate cake and pastry contain greater margins of inaccuracy than any formula extant for mixing mud concrete. What does a teaspoonful mean, heaped up or level with the rim? Or a teacupful? What size of teacup? How much is a pinch, or a handful, or a pennyworth? There is absolutely no standard system of measures conscientiously followed; and hence a woman will gage her ingredients by the grab with the same unquestioning faith in the accuracy of the combination that she reposes in the fact that the distance from the tip of her nose to the end of her fingers is precisely and infallibly one yard.

The practical solution of the important question, whether the masses can be educated properly to prepare their food, is yet to be determined. It is surely possible that cookery can be taught as a science, as other necessary branches of knowledge, not after the fashion of child's play, as have been most of the previous attempts in this direction, but as a serious study. We do not expect every man's wife to become a *cordon bleu*, or our servants to prepare *entrées* which would not disgrace Delmonico; but we do believe that means might be found of imparting information sufficient to relieve the people of many of the nightmare-breeding compounds of daily consumption. Make practical cookery a part of every woman's education, and the principles of the same a portion of that of every man. Let us, for recipes, have formulæ and instructions, clearly couched but as accurate as the physician's prescription, and deduced by scientific investigation. Then with the materials and means which we now have, better than which the world cannot produce, the answer to our petition for daily bread will not be food destructive to our health as individuals and as a people.

SCIENTIFIC AND PRACTICAL INFORMATION.

SWEDISH IRON.

The superior quality of Swedish iron is still maintained. The price for charcoal pig, in 1873, has been about $45 a tun. Ten years ago the same article sold at $19 per tun. It is supposed that the excellence of Swedish iron is due to the presence of tephrite, a silicate of manganese and iron. This is a discovery by M. Ingelstroem.

AN IMPERIAL THERMOMETER.

Professor Palmieri, of Naples, has recently completed a very ingenious and elaborate registering thermometer for the private use of the Empress of Russia. The instrument is of metal and is provided with bells, which give a signal whenever any considerable change of the surrounding temperature occurs. It is said to be so sensitive that the indicator is in a state of almost perpetual motion. Suitable devices show the extreme range of temperature during given periods of time. The apparatus is placed in the imperial traveling carriage.

THE CORINTH SHIP CANAL.

The Italian Consul at the Piræus, Greece, communicates to this government the news that the contract for opening a canal through the Isthmus of Corinth has been awarded to M. Tuvini, an Athenian banker. The conditions of the agreement are that the canal shall have a minimum depth of 28 feet and a breadth of 137 feet at the base. A basin and docks, with storehouses, etc., covering an area of 71 acres,