milk, and beverages, untainted by foreign substances; honest drugs, unadulterated by inferior mixtures; healthy, sanitary living and working quarters, with oxygen sufficient to nourish and strengthen life; and streets and avenues, as free from filth and dirt as broom, water, and chemicals will make them—these are the things which the Health Department stands for to-day in New York. It is what every city demands. But to get them the price must be paid—the price of energy and eternal vigilance, the price of intelligence and expert experience, the price of men and money consecrated to the cause.

CERTAIN CURIOUS EFFECTS OF THE VIOLET RAYS.

BY DR. JAMES WEIR.

This summer, while studying the effects of the violet and ultra-violet rays on plants, I discovered that these rays exerted a very unique and well-marked effect on the blossoms and foliage of the common field as well as the rarer perennial (Iceland) poppy.

Accidental happenings were, in a measure, the inciting cause for this especial study of the effects of the violet rays on the poppy. One morning I cut some poppies for decorative purposes. An hour or so after they had been placed in a vase, I noticed that they had withered. I was in the act of removing them when my mother stopped me, saying: "Don't throw them out; they will come to life during the night and will be all right to-morrow morning." My attention was attracted by the promise of such peculiar behavior on the part of poppies, and I at once began a course of observations and experiments in order to discover, if possible, the causes for this seeming death and resurrection.

On account of the rich and luxuriant foliage, the large, fleshy stems, and mammoth blossoms of the Iceland poppy, I chose it for the majority of my experiments, though the various kinds of field poppy, single, double, and fringed, red, white, and variegated, were also used and kept under observation.

It was noticed that the withering process began the very moment the flower was separated from the parent plant; the petals losing stiffness and resilience and drooping toward the stamens. This wilting continued until, finally, at the end of half or three-quarters of an hour, the blossom presented every appearance of being moribund. The immediate wilting indicated that, whatever the cause for it, that cause was instantaneous in action and had to do with the vital principle of the plant itself; there was instant interference with the life-producing and life-sustaining functions. Such cause, reasoning by analogy, must necessarily be both physical and chemical in character and action; I therefore conducted my experiments accordingly.

It was soon determined that the hour of cutting (*during daylight*) had nothing to do with the production of the phenomena, for the flowers were gathered at daylight, sunrise, 10 A. M., 12 M., 3 P. M., and 7 P. M., and it made no difference; the wilting process took place. Nor had temperature anything to do with it; the thermometer was carefully watched all through the preliminary experiments and its variations amounted to practically nothing. *But flowers cut at night would not begin to wither until they were exposed to light.* This indicated that light had something to do with causing this *quasi* death, and if this hypothesis were true, the cause was, primarily, chemical in nature and occasioned in all probability by certain particular rays.

I had discovered in former experiments that the orange, red, and yellow rays were not inimical to plant life and had published the results of those experiments and the conclusions derived therefrom in this periodical and elsewhere, therefore thought it hardly necessary to repeat them in this instance; I was satisfied I had to deal with certain unique effects of the violet ray (whose short wave of 380 $\mu\mu$ heads the solar spectrum, if spectra can be said to have heads), and those still more wonderful rays—the ultra-violet.

When those rays are cut off from a poppy by a screen of orange or red "postoffice" paper, the blossom will not wilt. The stem as well as the flower must be protected, otherwise wilting will take place. When a blossom is kept in the light (diffused daylight or electric light) for over fourteen hours, it loses the power of "coming to life" again; a longer exposure invariably kills it beyond recovery. In all experiments the stems of the cut flowers were immersed in fresh water, and all control observations carried on in a dark-room.

The most noteworthy phenomena to be observed in the effects of the violet and ultra-violet rays on the poppy are their immunizing properties. A poppy which has been subjected to the light and which has wilted and then "resurrected" *will remain unaffected when placed even in the direct rays of the sun!* An analogous process is seen in the effect of the violet and ultra-violet rays on the skin. The first exposure of those portions of the body ordinarily covered by clothing to these rays will result in destructive changes; blisters, etc., making their appearance with subsequent desquamation. But a second exposure produces little or no changes; the skin has become *immune*.

This fact of immunization will account for some of Finsen's seeming failures, if it does not account for all of them. This observer, in certain of his experiments, must have made his exposures too brief; he succeeded in getting only the immunizing effect of the rays; the exposures were too short to induce or achieve a lethal or deathly effect.

Microscopic examination shows that these rays produce marked physical changes in the cut stem, foliage, and flower. A section of the stem examined immediately after the blossom is cut shows that the effect on cell life is instantaneous; the cell at once begins to shrink and the protoplasm to collect around the nucleus. Circulation is interfered with, and this interference progresses as the blossom withers until there is no circulation in the veins and capillaries after two or three hours. Cell movement also ceases, and the entire structure presents every appearance of death. Indigo, cochineal, and eosin will be all the stains necessary for conducting a satisfactory examination and study of this exceedingly interesting instance of "suspended animation."

FRUIT AND NUTS AS FOOD.

The Department of Agriculture has for several years been conducting a series of experiments to determine the dietary value of different foods.

Nine dietary studies and thirty-one digestion experiments were carried on. In the majority of the dietary studies and all but one of the digestion experiments fruit and nuts constituted all or almost all of the diet. The results of the investigation emphasize the fact that both fruit and nuts should be considered as true foods rather than food accessories. The subjects were two women, three children, two elderly men, and two university students. The men all did hard manual labor during a part of the time, the students working to support themselves while pursuing their studies.

The fare given in these experiments was in every case one that would appeal to any normal appetite. It embraced honey, tomatoes, apples, bananas, cantaloupe, grapes, verdal, cornichon, tokay, muscat, scarlet haws, pears, pomegranates, persimmons, oranges, strawberries, watermelons, figs, almonds, and peanut butter. The only animal foods allowed were cottage cheese and eggs; and these in limited quantities. The cost of such a diet varied from 15 to 18 cents a day. Comparative experiments were carried along in which animal foods were employed under the usual conditions of living, and in these the daily cost ran from 26 to 30 cents. It was found that the food eaten supplied about 60 per cent of the protein usually secured by the average meat diet, while health and strength continued the same, if not improved, and in two or three cases there was a slight gain in flesh and weight.

One of the chief objects of the series of experiments was to furnish data as to the value of nuts as food. Fruits contain little protein, and nuts are relied on in the fruitarian plan of eating to balance the ration. Fruits are rich in carbo-hydrates and nuts in fat. A pound of peanuts, which costs 7 cents, furnishes 1,000 calories of energy at a cost of 3½ cents, and protein at a cost of 36 cents a pound. A porterhouse steak costs for the same result respectively 22½ cents and $1.31, when the steak can be bought for 25 cents a pound.

The average price per pound of the protein of nuts ranges higher than the corresponding average of meats, but the cost per pound of peanut protein is lower than for meats, fish, eggs, milk, dairy products, and prepared cereals. The only foods which furnish protein at a less cost than peanuts are flour and dried beans. According to Prof. Jaffa's experiments, nuts are the cheapest source of energy for the fruitarian, the peanut ranging far ahead of any other variety.

Although peanuts supply protein and energy for a smaller sum than bread, they are outranked by dried beans, which, at 5 cents a pound, will supply for 10 cents over 200 grammes of protein and 3,040 calories of energy.

Krafft has determined the boiling points of certain metals by the use of vessels of quartz heated by an electric furnace. Zinc sublimes below 300 deg., and at 640 deg. distills fairly quickly; the corresponding temperatures for cadmium are 322 deg. and 448 deg. Selenium distills quickly at 380 deg., tellurium at 550 deg., boiling being observable at 535 deg. Lead boils rapidly and distills at 1,160 deg. Tin proved very refractory, no distillation occurring even at 1,100 deg. At 605 deg. antimony sublimes slowly, and at 775 to 780 deg. distills rapidly. Sublimation of bismuth commenced at 540 deg., the sublimate assumed the form of drops at 930 deg., and the metal boiled briskly at 1,050 deg. A slight mirror of silver appeared at 1,090 deg., and rapid vaporization proceeded at 1,340 deg. Copper and gold boil at too high temperatures to be examined even in silica; with the former a slight amount of sublimate formed at 1,315 deg., with the latter extremely little vapor arose even at 1,375 deg., which is near the point at which the resistance of silica breaks down.

SCIENCE NOTES.

According to Bach and Battelli, the following reactions occur during the decomposition of carbohydrates in the animal system, their theories being based upon the decomposition of glucose. Glucose is first converted into lactic acid which is split up into alcohol and carbon dioxide. The alcohol at the moment of production is easily oxidized by the oxygen of the blood, with the co-operation of oxydases to acetic acid, which in its turn is decomposed into methane and carbon dioxide. The methane is oxidized to formic acid, and this is split up into carbon dioxide and hydrogen, the latter being finally oxidized to water.

That the "clinical" may be, at times, a source of danger has more than once been pointed out, and that organisms become fixed in the scratches of the glass caused by the graduation lines, so that they cannot be removed easily by simple washing and wiping, has been demonstrated. Stini has described, before the Société de Thérapeutique, a simple pocket case in which the clinical thermometer is carried always immersed in a sterilizing solution. It consists simply of a metal tube closed at one end with a tight-fitting cap, which screws on by a fine thread, and is fitted with a fluid-tight washer. The thermometer is inclosed in another close-fitting metal case, similar to that at present used, but freely perforated laterally with holes, so as to allow free access of the antiseptic to the instrument, in which it is by this means kept immersed. This smaller tube is carried in the larger one, partially filled with the liquid antiseptic. Any germicidal antiseptic may be used.

It was rumored not long ago that one of the five $40,000 Nobel prizes would be awarded to Finsen, whose light cure has made him world-famous. Although the statement is not true, there is no reason why Finsen may not be honored when the award is again made. It has long been known that there are certain rays of the spectrum which act as germicides; these are the visible violet and invisible ultra-violet rays. Finsen devised an electric apparatus which would give an abundance of violet and ultra-violet rays. The disorder which has been most readily treated by Finsen is tuberculosis of the skin, called by medical men lupus vulgaris. In a special hospital which has been established in Copenhagen, known as the Finsen Institution, 456 cases were treated up to the close of 1900. The treatment was necessarily severe, since few patients required 20 sittings of an hour each—one daily—while many needed from 300 to 500.

The Metropolitan Museum of Art has acquired the famous Roman frescoes of the villa at Boscoreale. Boscoreale has become famous since the first great finds made there ten years ago as the name of a villa on the slope of Vesuvius, near Pompeii, which was covered with ashes in the great eruptions during the year 1879. In the excavations which have from time to time been made, many an art treasure has been unearthed, which has found its way to this or that European museum. The first systematic exploration was begun in 1900. The famous villa, of which all archæologists now know, was then discovered. Erected in the most artistic taste, the walls of the building were covered with panel paintings. At first it was intended to leave the paintings on the spot, but it soon became evident that exposure to the weather would destroy them. The frescoes were cut from the walls and transported across Italy by special train. It is these frescoes which the Metropolitan Museum has acquired.

Much has lately been heard of the efforts made by Germany to establish the cultivation of various useful plants in her African colonies, but, according to P. Preuss, who is well qualified to speak on this matter, the outlook is by no means rosy. These efforts have been made in order, if possible, to render Germany independent of foreign countries for colonial products. In 1889 the government established botanical gardens in Victoria, at the foot of the Cameroon Mountains, in order to test the suitability of the climate for the cultivation of various plants, and also to produce seeds and plants for distribution. Since then no trouble has been spared to make the enterprise successful. Among the plants cultivated the cacao tree at first gave rise to hopes, but the quality of the seed soon fell off. In order to determine the reason of this, Preuss himself undertook an expedition to Central America in order to study the varieties of tree cultivated there and the methods of curing the seeds. As a result of this inquiry the prospects of the cacao cultivation have improved. Coffee and tobacco have hitherto failed, and the cultivation of other plants has been either unsuccessful or of so little value as to be of no practical importance. No matter where the ginger plants are brought from, none but typical African rhizomes are produced. Sisal hemp alone has the prospect of being a source of profit. At present more attention is being paid to india rubber, cotton, gutta percha, nutmeg, vanilla, pepper and clove, and palm oil. Earth nuts and sesame seed are looked upon as possible sources of profit.