AGRICULTURAL PAPERS.

A SERIES PREPARED ESPECIALLY FOR THE "RECORD-UNION."

Presenting Instruction Contained in Lectures from the Chair of Agriculture, State University.

[FIFTEENTH PAPER.]

Carbonic acid is the invariable product of organic combustion. It is composed of thirty-two parts by weight of oxygen and twelve of carbon. It is ordinarily a gas, but it may be liquefied under great pressure. It is found in large quantities, combined with metallic bases as carbonates of those bases. Chalk, limestone and marble are all simply different modifications of carbonate of calcium. Lime is manufactured from limestone by simply burning or calcining it, by which means the carbonic acid is expelled and the oxide of calcium or lime remains as a white powder. Some of the metallic carbonates furnish a large source of supply of the metallic bases. Carbonic acid is very readily dissolved by water, the quantity depending upon the temperature and pressure. Ordinarily water will absorb about its own bulk of carbonic acid gas, and at the freezing point it takes up twice its own volume of the gas. By application of pressure water can be made to take up many times its volume of this gas, but the excess of gas which has been forced into the water quickly escapes when the pressure is removed. The water of many soda springs, as they are called, has been impregnated with large quantities of

CARBONIC ACID,

Which has been forced into it by pressure in some of the recesses of the earth's crust. The effervescence of such water is caused by the rapid escape of the confined carbonic acid gas. Fountain soda water is simply an aqueous solution of carbonic acid, formed under great pressure, and flavored to order as drawn. Many of our bottled liquors and beverages likewise owe their sparkle and effervescent properties to the carbonic acid which they contain. It is considered that the normal atmospheric air contains about one three-thousandth part by volume of carbonic acid. The foliage of plants directly absorb carbonic acid from the atmosphere, and it has been proven that plants cannot flourish unless the atmospheric air surrounding them contains a requisite amount of this gas. After being absorbed by the leaves the carbonic acid is decomposed by the action of sunlight, and the carbon is fixed in and becomes a part of the stem, while the oxygen is exhaled into the atmosphere in the free state. Although absolutely necessary to the welfare of the vegetable kingdom, it has been found that pure carbonic acid is decomposed very slowly, if at all, by leaves, even when exposed to the sunlight, but that when diluted with some other gas or gases the decomposition proceeds with the normal rapidity. By careful manipulation it has been ascertained that the amount of carbonic acid absorbed by plants and the amount of free oxygen exhaled from them are almost the same; and as oxygen occupies the same bulk as a corresponding amount of carbonic acid—two atoms of oxygen occupy as much space as does a molecule of carbonic acid, which consists of one atom of carbon in addition to two of oxygen—it seems evident that plants retain mainly the carbon of the carbonic acid. The free oxygen which we spoke of as being necessary to, and absorbed by, the young and growing parts of plants unite with carbon contained in the plant with the formation of carbonic acid, which is therefore exhaled from plants in volumes corresponding to the amount of free oxygen absorbed. This process is exactly similar to the breathing of animals, and has heretofore been termed plant respiration. It seems to go on continually, and to be independent of the solar light. Thus we see that here are two

DISTINCT AND OPPOSITE PROCESSES

Going on in all plants—(1) respiration or absorption of oxygen and evolution of carbonic acid; (2) the reverse process, or absorption of carbonic acid and evolution of free oxygen. These two processes, while going on in the same plant and often at the same time, cannot, of course, take place in the same cells at the same time. The first process goes on continually, but the product of its action is in the day time generally more than counterbalanced, and hence more or less obscured by the evolution of oxygen caused by the action of the second process. This evolution of oxygen from the leaves can only take place under the influence of light, and is therefore principally confined to the day time. It is quite probable that much of the carbonic acid which is exhaled from particular cells of the plant, and which is a product of the first process, is immediately absorbed by other cells, and is, by the action of the light, decomposed into its constituent elements, and vice versa. From the great excess of carbonic acid exhaled by plants it is very difficult to directly perceive the evolution of carbonic acid taking place at the same time, but the excess of the product of one process over the other may be accurately computed. Under the action of diffused sunlight, and when shielded from the direct rays of the sun, plants often exhale carbonic acid in larger quantities than they do oxygen. The evolution of carbonic acid or oxygen is seen, then, to depend on the amount and intensity of sunlight, rather than to be functions peculiar to different stages of growth, and to different species of plants. Some house plants evolve carbonic acid during the night to a considerable and, in close rooms, to an injurious, extent. In the day time, when plants are subjected to the action of the diffused sunlight entering from one side of the room, the evolution of carbonic acid also takes place, but not to so considerable extent as in the night. It has been estimated that most plants absorb as much carbonic acid in from fifteen to twenty minutes, when subjected to the action of direct sunlight, as they would during the entire night. From this it appears that the amount of carbonic acid evolved by plants is relatively very small. When we consider that the carbonic acid of the atmosphere is the principal, if not the only attainable source of carbon of plants, and that plants are composed so largely of carbon, it seems surprising on first thought that the supply has not long since failed to meet the demand. The principal sources from which the atmosphere is kept supplied with carbonic acid are, first, the oxidation, during decay, of the carbon of organic matters; second, combustion, and third, animal respiration. It has been computed that although the carbonic acid of the atmosphere makes up but one three-thousandths of its volume, there is on an average twenty-eight tons of carbonic acid to each acre of land. Chevandier estimates that an acre of beech forest requires and assimilates about 1,950 pounds of carbon annually. To procure this amount of carbon three and one-half times as much carbonic acid must be absorbed. He says that if the whole earth were covered with a like growth of forest, the atmosphere, if there were no means of maintaining the normal amount of carbonic acid, would furnish carbon for only eight years. When we consider that but

ONE-FOURTH OF THE EARTH'S SURFACE

Is land, and that but a very small part of that land is covered with such a vegetable growth as Chevandier speaks of, we can very safely say that the atmosphere contains enough carbonic acid to meet the demands of the vegetable kingdom for one hundred years without renewal. The consumption of carbonic acid, great though it is, is quite effectually counterbalanced by its continual formation by the other processes spoken of, and which furnish sufficient carbonic acid to supply the plant-world with the requisite amount of carbon for many years. That carbon is derived mainly from the atmosphere is proved by the fact that plants may be brought to full maturity when grown in a soil containing absolutely no carbon, providing only that they be allowed free access to atmospheric air containing carbonic acid. The relation of the carbon of the soil to plants will be spoken of when we come to the consideration of the properties and constituents of the soil. It has been definitely ascertained that the formation of carbon in plants is intimately connected with the presence of chlorophyll, the green coloring matter of leaves, etc. It will be remembered that we came to the conclusion that the formation of chlorophyll was dependent on the presence of iron. By withholding iron from the plant the formation of chlorophyll was checked, and its influence on the assimilation and fixation of carbon noted. It was found that the assimilation by the plant of exterior matter was checked by the withdrawal of chlorophyll, and by microscopic examination, that carbon was only assimilated and fixed in those parts of plants which contained chlorophyll. Also that all parts of plants in which carbonic acid was decomposed with the fixation of carbon contained chlorophyll, even if their color was other than green. Light is also an essential agent in the fixation process, and seeds and plants growing in the dark do not gain in absolute weight, but actually lose weight by the loss of carbon and hydrogen during the continued respiration of the plant.

RELATION OF ATMOSPHERIC AMMONIA TO PLANTS.

Ammonia is known to almost every one by its peculiar pungent odor and its acrid taste. Ammonia gas is very soluble in water; so much so that if a bottle full of the gas be immersed under water and then uncorked, the water will rush into the bottle as into a vacuum, and will, if no air be present, completely fill it. Ammonia water, or hydrated ammonia, is prepared by passing a stream of the gas into cold water. At the freezing point water absorbs over 1,100 times its bulk of ammonia. The excess, and in fact all traces of the ammonia, may be expelled by heating the ammonia water. At ordinary summer temperatures water will retain only about one-half the maximum amount. The free gas is easily recognized by its smell, or it can be distinguished in its compounds by adding to them a little caustic potash, and heating. The potassium frees and drives off the ammonia, which may then be recognized by its odor. Ammonia is composed of one atom of nitrogen and three of hydrogen; or fourteen parts, by weight, of nitrogen to three of hydrogen. Under ordinary circumstances it cannot be formed by the direct contact of its constituents. Neither can they be caused when mixed in the above proportion to unite by any artificial means yet discovered. Ammonia is frequently a product of combustion, and is generated by the action upon each other of water vapor, air and some organic substances at a temperature from 120° to 160° Fahrenheit. It is also formed during the action of the alkalis and lime upon the albumenoids and other organic matter; also during the reduction of nitric and nitrous acids. It is most readily formed from organic nitrogenous matter by decay or dry distillation. Urine contains as an essential constituent a salt known as magnesia ammonia phosphate. If urine be allowed to stand for some time the ammonia gas escapes into the atmosphere in considerable and very appreciable quantities. The same compound of ammonia, magnesia and phosphoric acid is obtained as a bi-product in the preparation of bone black for sugar-refining.

AMMONIA

Is procured for commercial purposes principally from the gas manufactories. During the manufacture of coal gas ammonia is formed in considerable quantities. It is passed through water, or hydrated, and sold as "washing fluid," or "spirits of hartshorn," or "ammonia." The carbonate of ammonia is known commercially as "salts of hartshorn," and used to form the principal ingredients of ladies' "smelling bottles." It has the property of vaporizing very rapidly at ordinary temperatures. It thus passes from the solid to the gaseous form without assuming the intervening liquid state. As the quantity of carbonic acid in the atmosphere is much greater than the ammonia contained in it, it is presumed that the ammonia exists in the form of vaporized ammonia carbonate. This vapor is quite soluble in water, and as readily passes out of it upon a slight rise of temperature. Carbonate of ammonia is sometimes found in the solid state in freshly opened guano beds, but it soon vaporizes when in contact with the air. The amount of ammonia in the atmosphere is small and varies greatly in different localities. In one billion parts of air there have been found from 21 to 3,500 parts of ammonia. The higher results were reached when analyzing air of cities, or air which might easily have been impregnated with more than the normal amount of ammonia by local emanations. Johnson concludes that one part of ammonia in fifty million parts of air may be considered as about the average amount, but adds that "it is subject to considerable fluctuations." It has been established beyond dispute that ammonia contributes directly to the nourishment and growth of plants. Fertilizers containing salts of ammonia give the most apparent and striking results. If plants be watered with very dilute solutions of ammonia they will exceed by far, in luxuriance of foliage, plants which are supplied with all other nutritive substances except ammonia. If a small quantity of ammonia carbonate be allowed to vaporize in a conservatory or hot-house it will have a very decided effect upon the growth and luxuriance of the plants. In such applications care must be taken not to apply too much ammonia, as air containing four ten-thousandths or more, by weight, of ammonia carbonate vapor will injure delicate plants.

THE INFLUENCE

Which vaporized ammonia carbonate has upon plants enables us to see that ammonia is not only taken up by the soil, but is also absorbed from the atmosphere. This absorption of ammonia by the foliage of plants does not depend upon the action of light, but may go on continually—probably from the fact that at all times organic acids are present in the juices of plants which have an attraction for and chemically unite with atmospheric ammonia. The elements of ammonia are principally used by plants in the manufacture of albumoids—albumin, fibrin, casein—and hence we may estimate the beneficial effects of ammonical manures by the relative amounts of nitrogen which the sap assimilates from them. The direct effect of ammonia upon plants is to increase the length and luxuriance of their growth, and when applied in sufficient quantities will effectually prevent the formation of perfect fruit and seed. If ammonical fertilizers be applied to a plant which has finished its growth and is preparing to go to seed by pushing forth its terminal flower buds, the further development of the seed will often be entirely checked, and a very vigorous growth of new leaves and stems begin. An excess of ammonia has a tendency to greatly increase the foliage of a plant, and often times at the expense of the fruit yield. Ammonia visibly affects the color of the green parts of the plant, causing them to assume a deeper color, which is indicative of increased activity and vigor. When judiciously applied ammonia causes plants to yield crops which are richer in nitrogen than they otherwise would be. Now, inasmuch as the albuminoids and other nitrogenous food are the most desirable for all working animals, the direct effect of ammonia as a fertilizer can hardly be overestimated. Although plants can and do absorb ammonia from the atmosphere, yet they only do so to any considerable extent when freely exposed to the dew and rain. Plants have been grown which were given free access to the air but were sheltered from all moisture; when analyzed these were found to have absorbed but little ammonia from the atmosphere. During rainfalls and fogs the atmospheric ammonia is to a very large extent absorbed by the descending water and carried down to the earth and the lower strata of air. By this means many times the volume of ammonia which would otherwise directly surround the foliage of trees is made available to them, both through their roots and by direct absorption by the leaves. As one would suppose, the amount of ammonia in the atmosphere is very variable, and immediately after heavy rains is exceedingly minute. It has been estimated that the amount of ammonia brought down by rains is from 1 33 parts in ten million, and that in the immediate vicinity of cities the local emanations of ammonia are so great as to increase these amounts ten-fold. The amount of ammonia brought down by a rain necessarily depends upon the length of time which has elapsed since the previous fall of rain. As a general thing the farmer considers the water alone to be the agent which caused the almost marvelous growth of vegetation immediately after a copious fall of rain succeeding a lengthy drought, whereas were the ammonia which was accumulated by the water in its descent through the air taken from it, the perceptible effects of the rain might have been largely decreased. The amount of ammonia brought down annually by the agency of the descending water has been estimated as from six to twelve pounds per acre.

OZONE.

Ozone is a peculiarly active modification of oxygen. It is denser than oxygen, three atoms of oxygen uniting to form one of ozone. The principal characteristic of ozone is its intense oxidizing power. It has the power of oxidizing substances which are not in the slightest degree acted upon by free normal oxygen. Silver may be oxidized by surrounding it with ozone, and will, if heated, give off an amount of oxygen corresponding to that of the ozone which united with it. Many of the vegetable colors—indigo, litmus, etc.—are quickly bleached or oxidized by ozone. When breathed, ozone has a peculiar irritating effect upon the lungs, resembling somewhat that produced when inhaling chlorine gas. This may be noticed in the vicinity of electric batteries which have been in action for some time, and sometimes near electric lamps, giving rise to the "sulphurous" odor complained of by many. Ozone is a product of electrical and many chemical actions, especially rapid oxidation. It may be prepared experimentally by placing a piece of phosphorus in the bottom of a large glass vessel, and which contains enough tepid water to almost cover the phosphorus. After the white fumes of phosphoric acid have been absorbed by the water the air of the jar will smell very decidedly of ozone. Many organic bodies, and especially the vegetable oils, generate ozone when exposed to the air. Although as yet ozone has only been detected during rapid oxidation, it is more than probable that it is a product in all cases of oxidation; its effects being lost upon the observer either by reason of its uniting immediately with some other substance, or by its rapid diffusion into the atmosphere. Even if experiments have been somewhat contradictory it is more than probable, and generally supposed, that ozone is exhaled in appreciable quantities from plants under the influence of sunlight. The amount of ozone estimated as being found in atmospheric air varies from one to five parts of ozone in sixty-five million parts of air—an amount so small as to be almost inappreciable, but which no doubt directly and indirectly effects the processes of nutrition and growth of plants.

NITROGEN.

Nitrogen exists in the atmosphere as a constituent of numerous different compounds. It is an essential ingredient of nitric and nitrous acids, nitrous oxide (laughing gas), nitric oxide, and nitric peroxide, all of which are different compounds of nitrogen and oxygen, or oxides of nitrogen; and are substances which may be found in the atmosphere, either free or else in combination with other substances. As a rule the nitrates (compounds of nitric acid with some base) are very soluble. They differ from the nitrites in containing one atom more of oxygen in each molecule. By deoxidation nitrates may often be reduced to nitrites, and by oxidation the reverse process may take place. By chemical means we are enabled to decompose both the nitric and nitrous acid into ammonia, gas and water. This process is brought about by the use of deoxidizing agents, and may be carried so far as to obtain free nitrogen gas from the nitrates or nitrites. Nitrogen is an element which is very inert, and, in fact, can only with difficulty be forced into chemical combinations. Nitrogen compounds are principally formed in nature by the following three processes: (1) By the action of electrically formed ozone upon free nitrogen; (2) during the processes of combustion and oxidation, by the action of ozone or nascent oxygen upon free nitrogen; (3) they are to a considerable extent formed by the action of the ozone which is evolved from plants upon the free atmospheric nitrogen. This last source of nitrogen compounds is of most direct interest to the farmer. Presuming that plants do evolve an appreciable amount of ozone, it is not difficult to understand the reason for some facts in connection with the use of nitrogenous fertilizers. It is a well-known practical fact that the application of nitrogenous manures is followed by very different results upon different farm crops. It has been found by experience that the application of nitrates, guano, animal flesh, dung, blood, and flesh manures, etc.—all of which are rich in nitrogen—gave the best returns when applied to the cereals and grasses generally. Also that clover, turnips and such crops, were most benefited by the application of phosphates, potash and lime fertilizers. These facts are accounted for by the supposition that clover and turnips, even though they contain much larger quantities of nitrogen than the cereals and grasses, have a much greater ability of supplying themselves with nitrogen. If we suppose that plants are supplied with nitrates and ammonia by the action of the evolved ozone upon atmospheric nitrogen, we readily infer that their capacity for supplying themselves with nitrogen compounds is proportioned to the amount of ozone evolved, and hence depends upon the amount of

LEAF SURFACE.

This is undoubtedly the case, for the ozone emanating from the leaf comes in contact with the nitrogen on the surface of the leaf with the formation of some nitrogen compound which is immediately absorbed by the leaves. It seems very evident that the amount of nitrogen compounds supplied to a plant by the atmosphere is directly proportioned to the amount of leaf surface. This being the case, we are at no loss to understand why the grasses and cereals which are comparatively deficient in leaf surface should require a larger artificial or liquid supply of nitrogenous compounds than clover or turnips, which have correspondingly larger amounts of leaf surface. Another advantage which clover and root crops have over the cereals in regard to the amount of nitrogen acquired is that the evolution of ozone and the corresponding formation and absorption of nitrogen compounds in the clover and root crops continues, when the crops are cut green, up to the very moment of harvesting, thus affording an available supply of nitrogen until the crop ceases its growth. On the other hand, the foliage of the cereals dries up some time before the crop is matured, and just when the supply of nitrogen is most needed the leaves "shut down" on the formation of nitrogen compounds. By this means the available supply is very materially reduced, and the soil is drawn upon for the entire amount needed during the later stages of maturity. The roots of crops which are cut green contain full twice as much nitrogenous material as those of plants which have been allowed to ripen on the root. Therefore in reaping grain, for instance, the soil is greatly benefited by the nitrogenous matter contained in the roots; whereas, after grain has been allowed to ripen perfectly before cutting, most, if not all, of the nutritive matter has been removed from the root, and hence from the soil. Whether the above be true or not, it is, nevertheless, well-known that the cultivation of large-leaved and foliaged plants, and which are harvested while in active growth, a considerable amount of green stubble and refuse being left on the ground, tends to the

ENRICHING OF THE SOIL,

And especially in nitrogen. That is, the nitrogen is assimilated largely from the atmosphere, thus allowing from rainfall and other sources the nitrates, etc., to accumulate in the soil. This is a rational explanation of one of the causes of the effectiveness of rotation of crops, and as such deserves the consideration of all agriculturists and farmers. Without going into the theory of the formation and amount of nitric acid in the atmosphere, it will be sufficient to state that of all nitrogen compounds the nitrates are best adapted to furnish crops with nitrogen, and are of themselves a sufficient source if applied understandingly. The effects of their application correspond almost exactly with those following the application of ammonia compounds. They deepen the color of the foliage, cause a longer and more luxuriant growth, and when too freely applied have a tendency to decrease the seed crop. Nitrates do not vaporize at ordinary temperatures, and hence are not directly absorbed by the foliage of plants. They must, therefore, be acquired mainly through the roots, and from the liquids of the soil, which source will be discussed at another time. The other ingredients of the atmosphere, marsh gas, carbonic oxide, nitrous oxide, chlorhydric, sulphuric and sulphydric acid vapors, with organic vapor, and suspended solid matter, are of secondary importance, and with the space at our command it would not be advisable to speak of them. The last class—suspended solid matter—of the atmosphere, does not, strictly speaking, belong to the air, but rather to the soil. Nevertheless some species of plants are more or less dependent for their sustenance upon the atmospheric dust which is deposited from the atmosphere upon their upturned surfaces.

THE HOUSEHOLD.

BREAKFAST.—For breakfast, in addition to coffee, hoecake and fried potatoes, serve this dish: Make a plain omelet, and just before it is ready to take from the fire scatter over half of it some finely chopped ham, which you have already cooked, and which is hot; then double the outer half of the omelet over it; put on a hot platter and send to the table. For this you may use nice pieces of ham which have been left from the day before.

FROSTINGS.—It will be a surprise to some good cook to be told that she can make handsome and delicious frostings by using the yolks of eggs instead of the whites. Isn't this good news? It is such a convenience sometimes to be able to do it. Proceed exactly as for ordinary frosting. It will harden just as nicely as that does. This is particularly good for orange cake, harmonizing with the color of the cake in a way to delight the soul of the esthetic.

HOECAKE—Here is an excellent recipe for making hoecake: Scald one quart of corn meal with just enough hot water to make a thick batter; stir in two large spoonfuls of butter; beat this a little before mixing it with the butter, so it will rise readily; add half a teaspoonful of salt. This should be baked at least three-quarters of an hour; butter the tins well in which it is baked; serve hot. This is decidedly economical, and is very nourishing.

CORN.—One may gain that variety which is essential at the well-regulated table by preparing corn in this way once in a while: Take a can of corn, open it, and spread the corn over the platter to make sure that there are not bits of stalk or silk left in it; beat two eggs very light, stir in with them two tablespoonfuls of flour, one teaspoonful (not heaping) of salt, half a teaspoonful of pepper; have some lard very hot in a saucepan; and drop in the corn, a large spoonful at a time; fry same as green-corn fritters till a light brown.

TEA BISCUIT.—Delicious tea biscuit are made in this way: Boil one quart of milk for two or three minutes; let it cool, then add half a cake of yeast (dissolve the yeast in a little warm water first, and strain it so that the meal will not give a bitter taste to the dough); melt a piece of butter the size of a large walnut; stir this in with flour enough to make a stiff sponge. Let it rise for three hours, then roll and cut out the biscuit—make them thinner than for ordinary biscuits; spread them evenly with butter, double together, draw them out to make good shape, let them rise for from fifteen minutes to half an hour, then bake in a quick oven.

APRONS.—Nothing improves the appearance of the waitress at a table so much as a neat and tasteful apron. At a recent entertainment given in a church parlor a few very pretty aprons were worn. One was of white dotted muslin trimmed with a ruffle edged with Valenciennes lace; another was of plain muslin with two deep fluted ruffles of the same, with black velvet heading. Another had Valenciennes insertion put over blue ribbons, and still another was of plain white linen with a wide hem, and a broad band of ric-rac above that. Daintier than any of these, but less serviceable, was one of pale pink silk with a deep muslin flounce put on in plaits.

A TOUCH OF CONSCIENCE.—"The Bride of Lammermoor" strikes a far deeper note than any of its fellows, recalling, in its simplicity of idea, decision of movement, and deepening intensity of moral coloring, the solemn march of a Greek tragedy; and it seems to us that this almost solitary instance may be cited as showing the way in which a man's own weakness sometimes unconsciously gives the bent to his genius, and the warning within becomes the warning without. Scott was too unconscious to be aware of his temptation to the worldliness which was to cast so marked a shadow on his own later life, and perhaps he hardly recognized the lesson as to the close connection between worldiness and cruelty which is woven in with the pathetic tale, yet we cannot but believe that he painted with richer coloring when he delineated the perils of a vulgar ambition, because, unknown to himself, the palette of imagination had been touched by conscience. Apart from this influence, or one equally exceptional, Scott is as definitely the type of the unmoral writer of fiction as George Eliot is of the opposite.—[The Spectator.

LAMB AND MODERN WRITING.—Lamb displayed more of the temper of the Elizabethans than has been displayed by any other late writer—their loftiness mixed with playfulness, their deep insight into the mystery of human life, coupled with an acquiescence in a universe, the very existence of which they took for a proof that good is stronger than evil. And what strikes one most prominently in reading the "Elia" essays is that, had Lamb been living now, he would have found that such rich and glowing writing as his is not marketable. For this there are two reasons: First, the dry-rot of newspaper cynicism had not then entirely eaten into prose literature and destroyed it as a fine art; secondly, the hurry of everyday life did not then exact from the literary producer the utilitarian method and business-like expedition of presentment which destroy the basis of such literature as is to be found in Sir Thomas Browne, Bishop Hall, Jeremy Taylor, Thomas Fuller—the basis, we mean, of meditation.—[The Athenæum.

TORPID KIDNEYS, and constipated bowels, the great causes of chronic diseases. Take Kidney-Wort.

OUR BOOK TABLE.

NEWCOMB'S POPULAR ASTRONOMY—PHYSICAL EDUCATION, BY OSWALD.

Habberton's Latest Work — Higginson's Common Sense about Women—The Brain—Science and Culture.

COMMON SENSE ABOUT WOMEN. By T. W. Higginson. Boston: Lee & Shepard. Sacramento: W. A. & C. S. Houghton. 1 vol., 8vo.

This little book has attracted much attention by reason of the well-known character of the author as a friend of reforms, and as a literary light. Colonel Higginson, in this volume, has taken advanced positions without subjecting himself to the charge of being an extremest with a plan but without practicability. It is not possible in the limits of such a review as an ordinary notice affords to enter upon an exposition of all the features of these essays. We must content our readers and ourself with a glance at the topics treated. These are, as to the main divisions, physiology, temperament, the home, society, education, employment, principles of government, suffrage, and, lastly, a consideration of the chief objections to suffrage. He holds that woman is to be considered not merely as wife and mother, but as a human being also; he would have the young woman first read Buckle's lecture on the progress of woman and of knowledge; he holds that woman is not the weaker, because strength does not reside in mere brute force, and because the strength of men and women are to be compared on the basis of equivalent, and not of identity; that it is a pity to praise either sex at the expense of the other; that women should not be subordinated in the marriage contract and the marriage obligations; that while we should venerate our grandmothers, we will find their great grand-daughters are the best; that the essential change in the type of our women was effected in the last century and not in this; that all the physiological tendencies are favorable in the women of to-day; that the two sexes are mutually limited by nature, and that this is an argument for the enfranchisement of woman; it is folly and untrue to speak of women as "trials;" that the difference between ethics for women and ethics for men is simply in practical applications, not in principles; that no plea for woman should be based on the ground of her angelic superiority; that there should be no gospel of humiliation for woman; that women are a sort of cavalry force in the army of mankind; that woman is not a permanently fixed position in nature, as is so often assumed in arguments against any step for her elevation; he would expunge the word obey from the marriage service as being a badge of chattel slavery; he recognizes woman as the greater economist; there should be a double headship to the family, and this need involve no collisions; be the joint income what it may the wife has an honorable claim to her share, and he despises the word "allowance" as applied to the sum doled out to the wife; a woman should no more merge herself in her child than in her husband; woman should have the right of suffrage, that it may be of benefit to her children, and that she may have a voice in government as to their education. But we can go no further in indicating the tone of thought in this book. What has been given will sufficiently indicate the vein in which Higginson treats of woman. In the strongest sense he is the friend of the sex. He believes in her perfect equality before the law and with man, and that she should be circumscribed in no degree because of her sex. He writes with a vigor and freshness that is quite sure to awaken the respect of the most bitter opponent, and with a finish and grace that is delightful to those who admire scholarly exhibitions. One of the charms of the book is found in the exceeding brevity of the chapters, and the conciseness and almost epigramatic character of the author's style.

POPULAR ASTRONOMY. By Simon Newcomb, LL. D. New York: Harper & Bros. San Francisco: A. L. Bancroft & Co. 1 vol. large 8vo., muslin. $2.

This is the fourth revised edition, and is embellished by 112 illustrations and by five interesting maps. The work is not designed to instruct the special student in astronomy, or the professional investigator. The main object of Professor Newcomb has been to present the general reading public with a condensed view of the history, methods and results of astronomical research, especially in those fields which are of the most popular and philosophic interest at the present day, couched in such language as to be intelligible without mathematical study. That the author has accomplished this end, there can be no doubt whatever, and the reading public has recognized it by a demand that has passed the work into its fourth edition. This has enabled the author to include in it the latest discoveries and the most advanced knowledge of the day in the astronomical science. The third edition was an advance upon the first in the same manner, and included Professor Draper's investigations as to the existence of oxygen in the sun, Jansen's new method of photographing the sun, etc. The principal additions to the present edition relate to the latest advances in the building of telescopes, the transit of Venus, and recent developments in cometary astronomy. Respecting the general scope of the work, it may be said that the historic and philosophic sides of the subject have been treated with greater fulness than is usual in works of this character, while the purely technical side has been proportionately condensed. Of the four parts into which it is divided, the first two treat of the methods by which the motions and the mutual relations of the heavenly bodies have been investigated, and of the results of such investigation, while in the last two the individual peculiarities of those bodies are considered in greater detail. The subject of the general structure and probable development of the universe, which, in strictness, might be considered as belonging to the first part, is, of necessity, treated last of all, because it requires all the light that can be thrown upon it from every available source. Matter admitting of presentation in tabular form has, for the most part, been collected in the appendix, where will be found a number of brief articles for the use of both the general reader and the amateur astronomer.

PHYSICAL EDUCATION; OR THE HEALTH LAWS OF NATURE. By Felix Oswald, M. D. New York: D. Appleton & Co.

A radical work, but one of practical, sound sense, notwithstanding its occasional extremes of statement and view. Dr. Oswald considers the questions of diet, in-door life, out-door life, gymnastics, clothing, sleep, recreation, remedial education, hygienic precautions, popular fallacies, etc. He handles his subject without gloves, and no one can misunderstand him on any topic of which he treats. He is strongly impressed with the idea that, for all we are a progressive people, advanced in art, science, literature, and beyond question a people of the highest order of intelligence, yet when we come to the question of our physical part we write ourselves down asses. This, because we not only violate the simplest laws of nature, but we set them at defiance, and deliberately go about to make ourselves dyspeptics, and invalids generally. He objects to the system we have of preparing our food, and the method of cooking and eating it. While not a strict vegetarian, he believes we eat altogether too much animal food, and too little of fruit and like nutriment. Hot spices are altogether too frequent in our dishes, and as for alcoholic and other stimulants they are abominations that excite his ire and bring him to the utterance of the most violent language consistent with the dignity of such a work. His book is a manly, vigorous and timely protest against common evils. It is for sale by J. T. White & Co., San Francisco.

"The Californian" (San Francisco) for May presents amongst its papers these leading ones: "Studies of the California Missions," Frances Fuller Victor; "Death the Deliverer," Charles Edwin Markham; "A Talk about a Poet," James Berry Bensel; "A Logical Sequence" (Chapters VI, VII), Warren Cheney; "Out of Reach" (a camping medley), H. U. C.; "Francis Petrarch," T. H. Rearden; "Henry Wadsworth Longfellow," E. R. Sill; "The Story of the Mier Prisoners," James O'Meara; "The Lost Jeannette," Amelia Woodward Truesdale. It has several illustrations, and as a frontispiece an excellent portrait of Longfellow.

The "Atlantic Monthly" for May (Houghton, Mifflin & Co., Boston), has these chief articles: "Mad River, in the White Mountains," by Henry Wadsworth Longfellow; "The Arrival of Man in Europe," by John Fiske; "Old Fort Chartres," by Edward G. Mason; "Sage or Poet," by Edith M. Thomas; "Progress in Agriculture by Education and Government Aid," by Eugene W. Hilgard; "Studies in the South;" "Evolution of Magic," by Elizabeth Robins; "The French Panic," by F. Laurence Laughlin; "The Divine Right of Kings," by Mary W. Plummer; "Renan's Marcus Aurelius." All the usual serials and departments appear.

The "Brain and its Functions," is the title of Volume XXXIX of the International Scientific series, from the press of D. Appleton & Co., New York, and at hand from J. T. White & Co., San Francisco. It is by Dr. J. Luys, physician to the Hospice de la Salpetriere. The work is an abstract of his personal experience as regards this subject, and of most of the ideas he has for many years been endeavoring to popularize in public lectures at the asylum. It is divided into two very distinct parts. The first, anatomical, serves as the foundation of the work. It is followed by a second, purely physiological, which is its complement and necessary sequence. In the first part is explained all the technical processes employed in arriving at the results indicated; insisting at the same time upon the value of the method which he has found it necessary to adopt, which consists in making regularly stratified sections of the cerebral tissue, in the faithful reproduction of these by means of photography, and in the employment of successively graduated powers for the representation of certain details. In the second part, which comprises an explanation of the uses of the different cerebral apparatuses of which the anatomical details have been previously analyzed, he has given a physiological explanation of the different fundamental properties of the nervous elements, considered as living histological units.

"Harper's Magazine" (Harper & Bro., New York) for May is at hand. It is profusely illustrated. The leading papers are: "Spanish Vistas," by George P. Lothrop; "Majorie Gray," a poem, by Ada M. E. Nichols; "A Child's First Impressions of Death," by W. H. Beard; "Love's Empty House," a poem, by Louise Chandler Moulton; "Music and Musicians in Austria," by Mary Alice Seymour; "To Dianeme," a poem, by Robert Herrick; "David Rittenhouse," by Samuel W. Pennypacker; "Love and Death," a poem, by Edwin Arnold; "The Squirrel's Highway," by William Hamilton Gibson; "Some London Poets," by Edmund C. Stedman; "The Upper Peninsula of Michigan," by F. Johnson, Jr.; "Anne," a novel, by Constance Fenimore Woolson; "On the Nine-Mile," a story, by Sherwood Bonner; "Shandon Bells," by William Black.

"Mrs. Mayburn's Twins," by the author of "Helen's Babies," the well-known John Habberton, is the latest of that style of works. It is to be said that the story is a very different one from that which first brought Habberton so prominently before the American reading world. It is not a love story as was that, but a simple and very natural recital of one day's trials of a very loving, overworked and very excellent mother and wife, whose children are the source of all her sorrows and all her joys. There is through all the book a vein of keen satire that some, if not all, husbands would do well to profit by. It shows very plainly how unthinking most men are regarding the tasks that are exacted of mothers. The volume is for sale by A. L. Bancroft & Co., San Francisco, and is from the press of T. B. Peterson & Bros., Philadelphia.

The "Art Amateur" (Montague Marks, New York), is at hand for April. It is a superb number, and surpasses all others that have come from its press. Now that a new investigation is to be had by the New York Metropolitan Museum into the charges originally published by the "Amateur," alleging improper restorations in the Cesnola collection of Cypriote antiquities, that magazine discusses at length the new evidence in the case, and gives a supplement illustrating some of the startling transformations the statutes have undergone. The lover of fan painting will find in the "Art Amateur" a double page of charming fan designs, together with fine illustrations of eight notable French fans, five of which were shown at the recent New York exhibition. There are other and equally as pleasing features in the number.

From J. T. White & Co., San Francisco, we have Thomas Henry Huxley's "Science and Culture and Other Essays." It is from the press of D. Appleton & Co., New York. These essays have appeared at intervals during the past seven years, and are now for the first time published in one volume. They are thirteen in number, and are on "Science and Culture," "Universities," "Technical Education," "Elementary Instruction in Physiology," "Joseph Priestley," "The Method of Zadig," "The Border Territory Between the Animal and the Vegetable Kingdoms," "The Structure of the Heart," "Are Animals Automata?" "Sensation," "Evolution in Biology," "The Coming of Age of 'the Origin of Species,'" "Biological Sciences and Medicine."

Frank Leslie's "Sunday Magazine," T. De Witt Talmage, D. D., editor, has been received for May from Frank Leslie, publisher, New York. It is profusely illustrated, and is filled with a great variety of excellent religious reading matter and general miscellany.

"Calvert's Magazine" for April is at hand from H. J. Calvert, New York. It is devoted to art, science and literature.

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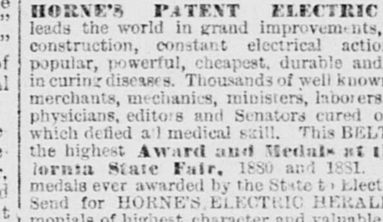

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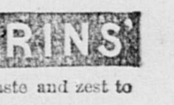

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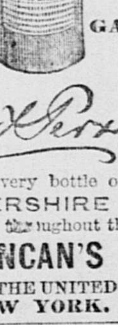

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