

isomeric compound of the ether of orthosulphaminebenzoic acid is formed, which I have designated as ethylsulphaminebenzoic acid, and which is isomeric with the above stated ether of orthosulphaminebenzoic acid. I have an investigation in progress which will prove that these reactions hold good for all sulphimides; as, for instance, terephthalic and mesitylenic sulphimides, and other bodies of the same constitution.

Having mentioned the first difficulties which I met with, and having given you a short outline of the chemical side of the saccharine question (the material which has been of late so prominently before the public notice), I wish, at this stage of my paper, to call your attention to the uses of saccharine in the arts, in the household, and in medicine. I may say that there are at the present moment a number of manufacturers using saccharine already for the purposes of sweetening bread, cakes, champagne, lemonade, oils, essences, and medicines of all kinds. Its sweetening power being three hundred times greater than that of sugar, you can imagine that it will serve for many purposes to which sugar cannot be applied, such as disguising the unpleasant taste of medicines, and be used in flavoring the food of patients to whom the use of sugar would be injurious.

One very important fact must be here pointed out with respect to saccharine, and that is its non-fermentable character, distinguishing it from the sweetening materials belonging to the carbohydrate class or sugar family proper. It is in no way altered by the action of yeast or other ferments, in the way that the carbohydrates are degraded; in fact, it rather acts in such a way as to prevent fermentation, so that saccharine retains its sweetening property under all conditions for an indefinite time.

In addition to the high sweetening power of saccharine, it has also antiseptic properties, which will make it useful in preserving articles of food, as I have frequently seen suggested in the newspapers. It is nothing more than a condiment or spice, and should never be tasted in the pure state, because taken in too large a quantity it will act upon the nerves in such a way as to paralyze the sense of taste, just as powerful music stuns or deadens the auditory nerves, or a very bright light acts upon the optic nerves.

I may inform you that almond and other breads are now to be had sweetened with saccharine, as well as champagne similarly sweetened, for diabetic patients and those suffering from fatty degeneration.

[Continued from SUPPLEMENT, No. 618, page 9873.]

PLANT ANALYSIS AS AN APPLIED SCIENCE.

By HELEN C. DE S. ABBOTT.

VERY many dye substances of vegetable origin are used industrially. It would detain us too long to enumerate the list, and I shall select a few of the well-known ones for illustration:

The dyewoods imported in a crude state are as follows:

<i>Camwood:</i>			
	Tons.	Value.	
1884	659.82	\$65,461.00	
1885	730	68,721.00	
<i>Fustic:</i>			
	Tons.	Value.	
1884	11,811	\$177,830.00	
1885	8,090	119,689.00	
<i>Logwood:</i>			
	Tons.	Value.	
1884	55,921.59	\$875,291.00	
1885	56,507.80	904,205.25	

The madder plant was formerly grown to a large extent in many countries, and in France³ large tracts of land were given up to its cultivation. "Madder" owes its importance to the beauty and fastness of the tints it yields, and to the fact that by a variation of the mordants used, it produces rose pink, black, violet, lilac, and puce colors." The character of the soil where the madder grows affects the color of the dye. The roots grown in a rich clay soil exhibit a rose pink color; under other conditions, a deep red coloration.

Alizarin, the chief coloring matter of madder, is now produced artificially from coal tar in large quantities, though the madder is especially in request for woolen dyeing. This plant, which yielded such large revenues to the growers, is replaced by a cheaper manufactured product. Very likely we should not have discovered the synthesis of its valuable dye if our attention had not first been directed to it in the plant.

When it is remembered that coal tar is undoubtedly of vegetable origin, the many brilliant dyes derived from this source are only evidences of what plant chemistry could have found in the carboniferous ages. The following statistics show:

<i>The amount of imported madder:</i>			
	Pounds.	Value.	
1884	253,385	\$13,521.00	
<i>Ground or prepared madder:</i>			
	Pounds.	Value.	
1884	1,458,313	\$111,456.00	
1885	1,211,370	80,628.00	
<i>The natural or artificial alizarin:</i>			
	Pounds.	Value.	
1884	778,660	\$296,123.00	
1885	1,470,864	404,002.00	
<i>Total value madder and alizarin:</i>			
1884		\$421,100.00	
1885		484,630.00	

Many species of plants grown in different parts of the world, but especially the *Indigofera*, yield a glucoside called indican, which under the influence of dilute

mineral acids and certain ferments breaks up, yielding indigo blue and a substance resembling glucose.

"Indigo" has undoubtedly been known in Asia from a very remote period of antiquity, since there exists in very ancient records, written in the Sanskrit language, descriptions of its mode of preparation mainly not different from the methods yet in use." The manner of cutting the plant and extracting the indigo is not the same in all countries. In India, the plants are grown from seed which are sown in the fall and spring, according to the kind of plant. As soon as the young plants are sufficiently forward, they are replanted in regular rows. The flower buds are pulled off before they are fully developed, experience having taught that by so doing the leaves of the shrub become larger and yield more indigo, the coloring matter being chiefly present in the leaves.

The indigo of commerce is a blue dyestuff extracted by fermentation. Other plants² used occasionally for the extraction of indigo are more frequently employed directly in dyeing; they belong to the *Polygonaceæ* family. These plants are from India, China, Central Africa, and South America, and they can be acclimated in all warm countries. In the mode of indigo manufacture³ two processes are employed. In the one the dry leaves are used, in the other the green leaves. This is the one in most common use. When the plant begins to flower, it is cut down at about six inches from the ground and carried to the steeping vats with as little delay as possible, strewn horizontally into the vats, and pressed down by means of beams fixed into side posts, bamboo being placed under the beams. Water is immediately run in just sufficient to cover the plant. The pure water from the Ganges is especially sought for in these manufactories, and many indigo factories line the river banks. The time for steeping depends much on the temperature of the atmosphere, and can only be learned by experience and careful watching of the vats; but in close, sultry weather, with the thermometer at 96° in the shade, eleven or twelve hours is sufficient. In cooler weather more time is requisite.

When fermentation is established, the surface of the vat is covered with a violet scum. The liquid is drawn off through plug holes, in the wall of the vat. The fecula at the bottom is then removed to the boiler. It is brought to the boiling point as quickly as possible, and kept there for five or six hours. While boiling it is stirred to keep the indigo from burning and skimmed with a perforated ladle. When sufficiently boiled it is run off to the straining table, where it remains twelve or fifteen hours draining. It is then taken to the presses and gradually pressed. This process takes twelve hours. It is then ready to be taken out, cut, stamped, and laid in the drying house to dry.

In the manufacture of indigo the ordinary processes of fermentation, drawing off the liquor, beating, and collecting the fecula are generally well known, and are followed with but trifling variation in different provinces and manufactories in India. The main points appear to be the watching and the soaking of the plant so as to be able to tap off the infused liquid exactly at the right point of fermentation, and next to beat the liquid in the second vat long enough.

Indigotin as it is contained in the vegetable tissues is colorless, but it becomes blue on contact with air. If it is desired to change indigo blue to indigo white, it is only necessary to place it in the presence of a deoxidizing and alkaline liquid, but as soon as air is admitted its blue color is resumed.

The dyeing of fabrics is based upon the transformation of indigo blue into soluble indigo white. The colorless matter is placed on the stuff, which becomes blue by exposure. The solubility of indigo in sulphuric acid is utilized for blue dyeing of wools.

Indigo has been made artificially by several methods, though the process so far is too expensive to manufacture the compound to replace the commercial supply from plants.

The table of statistics is as follows:

<i>Amount of indigo imported:</i>			
	Pounds.	Value.	
1884	3,074.48	\$2,267,048.00	
1885	3,035,934	2,007,066.00	
<i>Artificial indigo:</i>			
	Pounds.	Value.	
1884	None.	
1885	3,300	\$3,600.00	

The dye commonly known as logwood has been cultivated in Jamaica⁵ since 1715, and has been known and used in Europe from a short period after the discovery of America. The commercial supply of the dye is from *Hæmatoxylin campechianum*, a tree belonging to the natural order *Leguminosæ*. It is the wood of the tree which is used, and is met in commerce in the shape of large irregular blocks.

The only other tree besides logwood in which hæmatoxylin so far has been discovered is the *Saraca indica* of the same natural order.

I stated⁶ before the Academy of Natural Sciences, in November, the discovery of this principle in my analysis of the bark of the *Saraca indica*.

The *Saraca indica*⁷ is called in India the asok or asoka tree, and it is said when this tree is in full blossom there is nothing in the vegetable kingdom which affords a more beautiful object. Frequent mention is made of the plant in Hindoo mythology, and the bark is much used by native physicians in some diseases.

I undertook the analysis of this bark at the request of Messrs. Parke, Davis & Co., of Detroit, Mich., who liberally furnished me with a supply of the drug. The coloring principle exists in the bark in two or more conditions—as hæmatoxylin and as oxidized products. The former was separated as yellow crystals, analogous in form to hæmatoxylin crystals from the true logwood. The alcoholic extract of the bark contained about 18 per cent. of a red colored substance, which agreed in

color and dye tests with like constituents found in logwood. Mordanted cotton fabric was dyed with hæmatoxylin from *Saraca* bark, and presented the characteristic logwood dye colors.

The extracts of *Saraca indica* bark containing its coloring principle were tested with various reagents,¹ and it was observed that the reactions agreed with hæmatoxylin colors, and in no case with those of brazillin.

The bark of the commercial logwood tree is not used for extracting the dye, the wood of the tree being employed for this purpose. I determined the presence of a small quantity of hæmatoxylin in the logwood bark, and obtained with its extracts the same reaction without alkalis and other reagents as with the other wood extracts. But owing to the smaller percentage of dye in the bark of the specimens examined, the colors were less intense. In the case of the *Saraca indica* bark, the colors were very brilliant, and certainly indicated the presence of a large proportion of coloring matter in it. It would be of interest to secure specimens of the wood of *Saraca*, in order to determine if it contains the coloring principle, and should this be so, if it exists in sufficiently large quantities to warrant its introduction as a new source of this commercial product.

Last summer² I extracted from a Honduras plant, called "chichipate," a yellow dye. It yielded with mordanted wool fabrics colors resembling somewhat those yielded by fustic wood. A plant³ was analyzed in the laboratory of Parke, Davis & Co., named *Cascara amargo*, from which a new alkaloid, pascarnine, was separated. This alkaloid is like berberine in its properties. Specimens of this plant were lately forwarded to me, and there is every indication of the relationship of identity of "chichipate" and *Cascara amargo*. This incident is significant as deciding by means of chemical analysis the identity of plants under distinct names from different regions. No analysis under the name of "chichipate" had ever been published until my own report. The dyeing property of the substance, chichipatin, separated from "chichipate," I think is quite independent of the alkaloid, though berberine, it is well known, yields yellow colors with wool. I also separated a new camphor from this plant. It is crystalline, and under polarized light gives a beautiful play of colors.

During the year 1886, Prof. Trimble⁴ separated a new crystalline camphor, phloxol, from the underground portion of *Phlox carolina*. This substance resembles the camphor found in chichipate. It is soluble in petroleum ether, and this solvent is suggested as a means of distinguishing powdered *Phlox carolina* from *Spigelia*. The latter contains no camphor. *Phlox* is frequently put on the market for *Spigelia*. The two drugs in the normal condition can be readily identified.

An estimate of the profitable ends of the chemical analysis of plants may be gathered from the above statements.

Plant analysis covers a wide field, for it includes the chemistry of the living and the dead plant. Its application to various industries is far reaching.

Plant analysis in this country has been called an "infant industry." There are probably differences of opinion about the infant needing protection. It certainly needs encouragement and support, when its importance as a citizen is recognized.

Plant chemistry should not only be directed toward the study of new plants, but in the study of old plants it is to be encouraged, for each new investigation of many well known plants has revealed new chemical principles, and given additional knowledge of the old ones. We can never know to what practical uses the constituents of any plants may be brought, and the money value of this information should be considered.

Many chemical compounds which are of the most practical use, now made by synthesis, were first discovered in plants, products of living matter.

Synthetic chemistry has derived its knowledge from the results of analytical study. Researches in plant analysis have revealed many facts, though the exploration field is still wide.

In our present state of knowledge, plant chemistry is a safe political ground for either the protectionist or free trader. The vegetable cell has placed the tariff of human penetration so high, and protected so well its industry, that the plant enjoys the monopoly of proteids and a magazine of other substances. The free trader may console himself, for if he is intelligent enough he can find out the processes, and start his own factory, duty free.

Prof. Cohn, of Breslau, tells us that it is only a question of time when we may hope for the chemist to succeed in doing what the simplest *Algae* and mosses are able to do, namely, to produce starch from carbonic acid and water. On that day the bread problem, which is in fact the greatest of all social problems, will be solved.

It is indeed true that those organic compounds which are of the most importance in the life of the plant, the hydrocarbons and the albuminoids, are those which as yet have not permitted the secrets of their production to be discovered.

In the future, when synthesis has accomplished this prophecy and the synthetic chemist reigns supreme, our coming race to my imagination will be chemists, and our farmers will manufacture our food supply of proteids, sugars, and starch. The surface of the land will be one huge teeming laboratory. The plants, the analytical chemist and others of his race, asphyxiated by their environment, will have long ago passed away into a suffocating forgetfulness.

But, for the present, we must be satisfied to depend upon our humble colleagues, the plants, for our food and beverages, our fabrics, perfumes, and dyestuffs, our medicines, and other things too numerous to mention.

MANIA AND INEBRIETY.

By T. D. CROTHERS, M.D., Hartford, Conn.

THE following cases bring out the facts I wish to present:

A—had two attacks of acute mania in five years

¹ S. P. Sadler and W. L. Rowland. *Amer. Jour. Pharm.* Feb., 1881.
² Preliminary Analysis of a Honduras Plant, named "Chichipate." Paper read before the A. A. A. S., at Buffalo, August, 1886.
³ "Cascara Amargo." By F. A. Thompson. *The Ther. Gazette*, Jan. 15, 1884, p. 8.
⁴ "An Analysis of the Underground Portion of Phlox Carolina." By Henry Trimble. *Amer. Jour. Pharm.*, October, 1886, p. 479.
⁵ Hand Book of Dyeing and Calico Printing. W. Crookes. P. 447.
⁶ Matieres Premieres Organiques. Par Penetier. P. 513.
⁷ Matieres Premieres Organiques, p. 516. Bul. de la Societe Industrielle de Mulhouse, vol. xxviii, p. 307.
⁸ Bureau of Statistics. 1885.
⁹ Crookes, p. 342.
¹⁰ "On Hæmatoxylin in the Bark of Saraca Indica." By Helen C. De S. Abbott. *Proc. Acad. Nat. Sciences*, Phila., Nov. 30, 1886.
¹¹ The Materia Medica of the Hindus. By Udoy Chaud Dutt. Calcutta, 1877.

and recovered. He was able to go on with his business (that of a builder) with no apparent evidence of incapacity. He was a temperate, hard-working man, but had a neurotic heredity. Premonitions of another attack of mania appeared, and arrangements were made for his removal to an asylum, when he suddenly disappeared.

Two weeks later he was found in a hotel, where he had been intoxicated every day, but attracted no attention in act or thought. His removal home was followed by a rapid recovery, and soon he went about his business as usual. Ten months later, after a period of excitement, he rushed to a saloon and drank to stupor. He was taken home, was delirious for a week, and then recovered. Two months after, he secreted himself in a saloon and drank for a week to stupor, then went home fully conscious and recovered. Since that time he has had three attacks in which the impulse to procure spirits was uncontrollable. On two of these occasions he was restrained, developing a confused mania of two weeks' duration and a long period of convalescence. On the third attack he ran away, and after four or five days' drinking to stupor returned, and recovered rapidly.

This question came up: Should he be allowed to go away and drink to great excess when the drink impulse came on? or, Should he be restrained at home or in some asylum, where he would probably have mania?

The increasing frequency of these paroxysms, and the large business interests under his control, started inquiry as to his mental responsibility. Two medical experts found no indications of insanity or mental incapacity, based on an examination in the free intervals of his paroxysms. The drink impulse was regarded as a moral lapse, and the mania appearing when he could not procure spirits as simulation.

In my opinion this man was insane, and the paroxysmal inebriety was only a symptom. His real mental condition was concealed, because he lived along accustomed lines of thought and act, and hence acted automatically, and could keep up a semblance of sanity without effort.

B—came under my care, a neurotic by inheritance and a periodic inebriate. Nothing unusual was noted until the return of the paroxysm, when he ran away, and was found a short time after, having drunk two or three glasses of spirits. He was placed under restraint, and very soon after had an attack of acute mania. This lasted twenty-four hours.

After a week's convalescence he was about again as usual. The return of the next paroxysm was marked by the same mania, when restrained, of nearly the same intensity and duration.

He escaped on the return of the third paroxysm, and drank to stupor for two days, then was found and returned. The recovery was rapid, and later he was placed in the care of another physician. Here the same experience was repeated. The drink paroxysm became a confused, trembling mania when restrained from procuring spirits; but if he could be intoxicated for a day or more, he would recover rapidly. Nothing less than profound stupor seemed to break up the mania.

This man possessed property, and the same question of responsibility came up. Like all others of this class, he had delusions of power to stop at will, and regarded his drinking as moral weakness and of little moment.

The following case came to me for consultation: A man in active business suffered from a heat stroke, and soon after became a periodic inebriate. These drink periods were always preceded by states of unusual exhilaration, great buoyancy of spirits, self-confidence, and muscular activity. His wit and humor were overflowing and boisterous, then suddenly he would disappear and be found later stupidly intoxicated.

If any obstacles intervened, he would spend large sums of money to procure spirits, seeking retirement where he could indulge unmolested. In a few days he would recover and go home, and after a short period of rest go out again as before.

These periods increased in frequency and duration, and the question of placing him under restraint when the premonitory mental exhilaration came on was proposed. He consented, and was placed in a private insane asylum. Two days after, he had an attack of acute mania, and did not recover so as to go out for two months.

On the return of the next attack he went to a physician's house, where the mania reappeared with great severity.

At the next attack he ran away, and was stupidly intoxicated for four days, and then quickly recovered.

On the next occasion he was restrained in a hospital, had mania, ran away, became intoxicated, and while in this state lost large sums of money. The same question of responsibility, and what should be done, came up. To the advice to give up business and go under medical care, the objections were his apparent good health and large business interests, which he conducted with pleasure and skill, and temperate life in every respect except at these periods. Occupation of both mind and body seemed essential to his health. To give up business and travel was especially dangerous, and to restrain him when these periods came on always developed mania. If allowed to drink to stupor for a time, other dangers appeared. In these drunken states he gave away large sums of money and signed notes.

The counsel of many eminent men has been sought, and still no solution has been reached.

In the future the narcotic action of alcohol will fail, then permanent mania will appear. When alcohol is withheld, mania comes on; when it is given, the mania is prevented.

These cases are unusual, but they outline many symptoms and conditions that are more or less common in all periodical cases of inebriety and dipsomania.

The drink impulses in these periodical cases are states of mania seeking relief from some physical pain or agony. This may be found in drugs as well as alcohol, and when ungratified manifests itself in complex mental symptoms of disorder and disease.

A clergyman who was a periodical inebriate, and was cured, has regularly every three months short periods of intense mental irritation. At these times he is angry at everything, is suspicious, and abuses his best friends. When this passes away he apologizes, and regrets his conduct keenly. He has not drunk any for four years. These periods last for three days or more, and are literally manias.

A professor in a medical college, who used alcohol to

excess for years, and then abstained, has periods of two or three days' duration during which he is plunged into the deepest melancholy, with the belief that he is going to die; hence gives up business for a time. Then suddenly the melancholy will pass away like a cloud, and he will laugh at his past fears and conduct.

These cases, which exhibit many phases of mental degeneration in distinct paroxysms, are common in persons who have drunk to excess and become abstainers. Are they caused by the drink paroxysms of long ago? or are they symptoms of other mental disease which have been aborted by the drink impulse and exist as traces of other brain disorder?

In some cases it is clear that the drink impulse is another form of insanity, which from unknown causes develops in this way.

The very close relation which exists between these periodical drink impulses and complex manias, and the alternation of one with the other, open new fields of research, which often have great practical interest. Thus in one case where the drink impulse was preceded by melancholy, an important will was written that indicated incompetency, and was in the courts for years. This depended on the failure of the physicians to understand the mental condition of the victim.

Another case comes into court where a merchant kills a clerk for his efforts to prevent him from drinking. He was suffering from mania, which preceded or followed restraint from drink. A periodical inebriate made some business transaction which wrecked a large firm, and then developed the drink impulse. The unusual character of this act, just before the drinking period, indicated mania and incompetency, but the court failed to recognize this. The family physician often recognizes states and conditions that are manias, pointing clearly to the irresponsibility of the person. When called to give testimony in court, he finds himself unsupported by any teachings of authority, and hence fails to make his views clear.

The following conclusions may be stated as authoritative, and fully sustained by all clinical study so far: The inebriate is in all cases, as a rule, insane, and of lessened capacity to reason and act normally. The periodic inebriate suffers from a marked mania, which may turn in any direction, taking on almost any form.

Careful study of the symptoms of these cases indi-

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cates the gravity of the brain degeneration and the incapacity of the victim. It also points out the intimate association of periodical inebriety with insanity. The drink impulse when gratified may prevent a more serious outbreak of insanity and permanent brain lesion. The inebriety is often a symptom of brain disease.

The responsibility and mental integrity of periodical inebriates should always be the subject of investigation, under all circumstances and conditions.—*Med. Record.*

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