employ it to render neon non-volatile while the helium with which it was mixed was being completely removed, was certainly something new in laboratory technique. The separation of minute quantities of krypton and xenon from argon was another triumph of patience and manipulative skill.

(10) It is hazardous always to indulge in comparisons. Lord Rayleigh possessed to an extraordinary degree the power of devising simple means to produce desired results. Whether he possessed anything comparable with Ramsay's skill in constructing before the blowpipe, and later, manipulating delicate pieces of glass apparatus, I am in doubt. Both men were doubtless highly ingenious: Lord Rayleigh in avoiding difficulties, Ramsay in overcoming them. Each possessed a charming personality—was blessed with a fund of humor and a delightful courtesy. To offer genuine hospitality to the stranger, to show generous appreciation of his efforts, however modest, seemed to be instinctive with each of them. To have enjoyed a friendship such as they bestowed is, to this writer, a source of pride and will always keep alive towards them a profound sense of gratitude.

BELLADONNA PLASTER.

STANDARDS AND TESTS.

BY FRED B. KILMER AND F. L. HUNT.

There is a long, long trail of history behind such a commonplace thing as a Belladonna Plaster.

Through the maze of legend and written history, we find that the cave man and the nomad had, in some way, gathered a knowledge of the Narcotic Solanums, and applied them for their pain-relieving power.

Hyoscyamus and the Daturas, the famous Mandragora and the Belladonna, have been the pain-relieving Nightshades of widely separated primitive races. The leaves of these plants were applied as poultices, their juice was spread on skins, or made into salves and then spread as a plaster.

Somewhat interesting is the fact that when the Spanish invaded South America, they found the Indians applied a compound of stramonium and pepper as a pain-dispelling poultice or plaster. Here perhaps is the primitive origin of the now popular Belladonna and Capsicum Plaster.

In running through the ages it is of further interest to note that men have, from the beginning, gathered the Narcotic Solanums into a group, owing to their peculiar pain-relieving power, and to them they applied a group name that in widely separate tongues works out into "Nightshade." Further, we find that whatever species of Nightshade may have been peculiar to a country, it was the equivalent of the Narcotic Nightshades of other lands.

Thus, the Datura of India, the Mandragora of Syria, the Hyoscyamus of Egypt, and the Belladonna of Europe, appear confusedly in literature and lore as equivalents in properties and in name. In our own land, the *Solanum nigrum* is quite commonly called Belladonna, and with the Zuni Indians, the *Datura meteloides* is "Indian Belladonna."

In an historical study, a plaster made of any Narcotic Solanum, may be considered as equivalent of a present day Belladonna Plaster.

The use of lead bases for plasters goes back at least fifty centuries. The Diachylon mass, formulated by Menecrates (A.D. 1), is still in use. India-rubber mass plasters are of American origin, beginning about the middle of the 19th century.

The pharmacist is quite apt to look upon the commonplace belladonna plaster as one of the many jokes in medicine. The up-to-date physician looks upon them as harmless, possibly useless.

It seems hardly possible that belladonna plaster could have held its place through the ages if either of these conclusions were correct. It is a notable fact that more belladonna plasters are now being used to relieve the ills of mankind than ever before in the history of the world. Of late years some physicians have discarded belladonna plasters, stating that the local application of belladonna in this form was without action.

Dr. H. C. Wood, the noted therapeutist, stated that "when belladonna is applied to a part it acts locally as a paralysant, overpowering the capillary cells, the sensitive motor nerves, and even muscular and glandular cell action."

According to the late Dr. W. C. Caldwell, "belladonna, when applied to the skin as a plaster, liniment or ointment in large quantity, may be absorbed sufficiently rapid to produce all the symptoms that are developed when taken internally." For the relief of pain, he stated that "its anodyne action is a thousand times stronger when applied at the seat of pain than when taken internally. For the relief of pain the plaster is usually better than the liniment or ointment."

In conditions where there is a peculiar susceptibility to the action of belladonna, the application of a belladonna plaster has been known to be followed by the annoying symptoms of dilation of the pupils of the eye, dryness of the throat, rash, and other manifestations of belladonna action.

Authorities state that plasters made with an india-rubber base have, in common, a mechanical action, protection of the part to which they are applied, limitation of motion in the underlying tissues, and support, and that through this action they produce continuous massage. In addition to the foregoing, with a belladonna plaster we would have the continued action due to the medication (belladonna) contained in the mass, thus producing an anodyne and incidentally an action tending to check secretions.

STANDARDS.

Probably from the fact that it was long held that the leaves of belladonna were more active than the root or other parts of the plant, pharmacopœias and formularies prescribed the use of the extract of the leaves in making belladonna plasters.

The root of belladonna was not recognized officially in England until about 1860, when it was recommended for use in liniments. The United States Pharmacopœia, revision of 1880, prescribed the use of a specially prepared extract of belladonna root for use in a plaster. In 1890 this was changed to the extract of the leaves, the revisers stating that they were influenced to select the leaves from

the fact that "there is a greater uniformity in the quantity of alkaloids present in the extract from the leaves than in the extract from the root."

The British Pharmacopœia has quite uniformly favored a plaster made from extract of the leaves.

Just as accurate uniformity of alkaloidal content can be secured in preparations made from the root as in thòse made from the leaves.

The proper standard for any drug preparation of this character is the alkaloidal content, irrespective of the part used, or the proportion of extract employed. Thus, the British and the American Pharmacopœias, in prescribing an alkaloidal standard for belladonna might, with propriety, allow the use of an extract from either root or leaf, or even the whole plant.

Well-founded objections exist against the use of the extract of belladonna leaf in a plaster. The extract of the leaf does not give as homogeneous a mass as does the extract of the root, especially when used in a compound containing rubber. The chlorophyl produces an objectionable green color, which stains the cloth upon which the plaster is spread, as well as the face of the cloth covering the plaster, rendering it unsightly.

Through public demand, belladonna plasters made from the extract of the root are now in universal use.

The 1840 edition of the U. S. P. was the first to admit belladonna plaster, the formula being—Resin Plaster, 3 ounces, Extract of Belladonna Leaves, $1^1/_2$ ounces. The extract was obtained by percolating the leaves of belladonna with dilute alcohol. The next two editions retained practically the same formula, but the 1870 edition called for extract of the root. Here the plaster mass contained the extract percolated with pure alcohol, and enough Resin Plaster was added to make the total weight represent the original weight of the belladonna root. In the 1880, or sixth edition, the formula remained unchanged.

In the seventh revision (1890), by calculating the amount of mydriatic alkaloids in the extract used, the plaster should contain 0.3% of alkaloids.

The next edition, the eighth (1900), stated that belladonna plaster should contain not less than 0.38%, nor more than 0.42% mydriatic alkaloids. In this edition, following the directions for the preparation of the plaster with a rubber base, is a method of assay. This is the first time an assay process for belladonna plaster is noted in the Pharmacopœia. The method proposed was one which has been found to be successful.

A slightly lower standard is found in the U. S. P. IX (1910), the requirement being that it should yield not less than 0.35%, nor more than 0.40% belladonna alkaloids. This Pharmacopœia became official September 1st, 1916, and its requirements were legal from that date. The above standard for belladonna plaster, however, was subsequently reduced to 0.25%, as we shall see later.

In 1918, as a result of the scarcity of belladonna, and in order that the depleted stocks of belladonna on hand might be conserved for other medicinal purposes the American Drug Manufacturers' Association requested the Committee on Revision of the United States Pharmacopœia to adopt the standard of 0.25%, not only as a war measure, but because this standard had been shown to be of therapeutic value. In this recommendation the Committee on Revision concurred.

The adoption of this pròposed standard was a step toward establishing a

universal standard for belladonna plaster. The standard of 0.25% alkaloids conforms to the 1914, or present, British Pharmacopœial requirement. Previous to this, the 1898 British Pharmacopœial standard of 0.5% alkaloids was found to be too high, because cases of poisoning, characterized by impaired vision (dilation of the pupil) and dryness of the throat, had occurred. As a consequence, the British Pharmaceutical Conference approved reducing the standard to just one-half the former strength, and the 0.25% standard was adopted by the British Pharmacopœia in 1914. This is also the standard of the British Codex, the Cuban Pharmacopœia and the Farmacopeia Latino Americano.

The American Drug Manufacturers' Association also recommended that inasmuch as there was no standard for Belladonna and Capsicum Plaster, it should contain 0.125% alkaloids of belladonna and 5% of powdered capsicum. This is half the alkaloidal strength of the plain belladonna plaster.

We give here a table showing the formulas and standards for belladonna plaster as shown in the pharmacopœias of the world so far as we have been able to obtain them.

BELLADONNA PLASTER.

FORMULAS IN VARIOUS PHARMACOPŒIAS.

Farmacopea Nacional Argentina primera edicion, 1898—No formula.

Pharmacopœa Austriaca editio octava, 1906—No formula.

Pharmacopœa Belgica editio tertia, 1906—No formula.

British Pharmacopœia, 1914—Liquid extract of belladonna root—50 millilitres; Resin plaster—137.50 grammes. Standard, 0.25 per cent. of the alkaloids of belladonna root.

Farmacopea Chilena, 1905—Extracto fluido de belladona—treinta partes 30; Emplasta de pez—setenta partes 70; Elemi—quince partes 15; Aceite de oliva—cinco partes 5; Haganse cilindros.

Pharmacopoea Danica, 1907—No formula.

Pharmacopoea Fennica editio quinta, 1914—No formula.

Pharmacopée Francaise Codex Medicamentarium, 1908, Supplement 1920—Extrait de belladone—vingt-cinq grammes 25; Elemi purifie—vingt-cinq grammes 25; Emplatre diachylon gomme—cinquante grammes 50.

Pharmacopœa Germanica, editio quinta. 1910—No formula.

Pharmacopœa Helvetica editio quarta, 1907—Extractum belladonnæ—10; Elemi—10; Colophonium—20; Emplastrum adhaesivum—60.

Farmacopea oficial Espanola septima edicion, 1915—Extracto de belladona—200; Emplasto de pez de Borgona—750; Aceite de olivas—100.

Pharmacopœa Hungarica editio tertia, 1909—No formula.

Farmacopea ufficiale del Regno d'Italia terza edizione, 1920—No formula.

The Pharmacopœia of Japan, 1906, English translation 1922—No formula.

Farmacopea Latino—Americana, 1920—Extracto liquido de belladona—50.0 cc.; Emplasto de resina—137.5 gr.; Contiene 0.25 por 100; de los alcaloides de la raiz de belladona.

Farmacopea Mexicana, cuarta edicion, 1904—Polvo de hojas de belladona (tamiz num. 5)—20; Alcohol, 90%—10; Amoniaco a 22°—1; Cera amarilla—30; Trementina—25; Colofonia—25.

Farmacopea Nederlandica, editio quarta, 1905, supplement, 1910—No formula.

Pharmacopœa Norvegica, editio quarta, 1913—No formula.

Pharmacopea Romana, editio tertia, 1893—No formula.

Pharmacopœa Svecica, 1908—No formula.

Farmacopea Venezolana, 1910—Extracto de Belladona—25.00; Resina Elemi—25.00; Emplasto de Diagiulon gomad—50.00.

Pharmacopœia of the United States, Ninth Decennial Revision, 1916—Extract of Belladonna Leaves—30 per cent. (rubber mass). Standard not less than 0.25 per cent. nor more than 0.30 per cent. of the alkaloids of Belladonna Leaves.

British Pharmaceutical Codex, 1924—Dry extract of Belladonna Leaves—25 parts; Rubber Adhesive Plaster to 100 parts. Standard 0.25 per cent. of the alkaloids of Belladonna leaves.

The U. S. P., Revision IX, established the standard for belladonna plaster in the following language:

"An adhesive plaster containing 30 per cent. of extract of belladonna leaves and yielding not less than 0.25 per cent. nor more than 0.30 per cent. of the alkaloids from belladonna leaves."

This statement is somewhat ambiguous. As it reads it assumes that an extract of belladonna leaves will be used of such a strength that 30 per cent. of the extract in the mass will yield a mass containing from 0.25 to 0.30 per cent. alkaloids. If 30 per cent. U. S. P. extract were used it would give a mass containing 0.375 per cent. alkaloids.

This standard allows for no variation in the alkaloidal content of the extract. If 30 per cent. extract of belladonna leaves were incorporated in a plaster mass, it would produce a sticky, unworkable compound.

There is no method known to us by which the alkaloid of belladonna leaves can be distinguished from the alkaloid of the root.

The revisers evidently intended to require that the mass should contain not less than 0.25, nor more than 0.30 per cent. of mydriatic alkaloids.

In the manufacture of belladonna plasters on a large scale, uniformity of alkaloidal content and compliance with the alkaloidal standard, are secured by the following procedure:

Each lot of extract is assayed, and its alkaloidal strength placed upon the label. Different lots of extract, of course, vary in alkaloidal content. A table is constructed showing the amount of extract of a given assay (Col. 1) that should be added to a given weight of plaster mass (Col. 4) in order to produce a finished mass meeting the required alkaloidal strength.

Per cent. alkaloid in extract.	Ratio mass to extract.	Per cent. extract in compound.	Extract used for 200 lb. mass.	Per cent. alkaloid in extract.	Ratio mass to extract.	Per cent. extract in compound.	Extract used for 200 lb. mass.
2.00	7.00	12.50	28.57	2.22	7.88	11.26	25.374
2.01	7.04	12.44	28.409	2.23	7.92	11.21	25.256
2.02	7.08	12.38	28.248	2.24	7.96	11.16	25.128
2.03	7.12	12.32	28.09	2.25	8.00	11.111	25.00
2.04	7.16	12.26	27.93	2.26	8.04	11.06	24.878
2.05	7.20	12.195	27.77	2.27	8.08	11.01	24.756
2.06	7.24	12.14	27.624	2.28	8.12	10.97	24.634
2.07	7.28	12.08	27.47	2.29	8.16	10.92	24.512
2.08	7.32	12.02	27.32	2.30	8.20	10.869	24.39
2.09	7.36	11.96	27.17	2.31	8.24	10.82	24.273
2.10	7.40	11.904	27.03	2.32	8.28	10.78	24.157
2.11	7.44	11.85	26.88	2.33	8.32	10.73	24.041
2.12	7.48	11.79	26.74	2.34	8.36	10.68	23.925
2.13	7.52	11.74	26.59	2.35	8.40	10.638	23.809
2.14	7.56	11.68	26.45	2.36	8.44	10.59	23.700
2.15	7.60	11.627	26.31	2.37	8.48	10.55	23.589
2.16	7.64	11.57	26.176	2.38	8.52	10.50	23.478
2.17	7.68	11.52	26.042	2.39	8.56	10.46	23.367
2.18	7.72	11.47	25.908	2.40	8.60	10.416	23.256
2.19	7.76	11.42	25.774	2.41	8.64	10.37	23.151
2.20	7.80	11.363	25.64	2.42	8.68	10.33	23.045
2.21	7.84	11.31	25.512	2.43	8.72	10.29	22.939

ASSAY PROCESSES.

The simplest test to ascertain the presence of mydriatic alkaloids in a plaster, is to extract the alkaloid and apply a drop of a very weak solution to the eye.

Prescott's "Organic Analysis" and Lyons "Pharmaceutical Assaying" were the standard textbooks on alkaloidal assaying at the time of the sixth and seventh editions of the U. S. P. At that time Mayer's Reagent was used in the valuation of the alkaloid, it having been found by workers that it combined with belladonna alkaloids in nearly definite proportions.

In an excellent article on belladonna plasters, by Seward W. Williams and C. E. Parker, in the PROCEEDINGS OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, 1890, the authors advocated the use of Mayer's Reagent, in preference to the gravimetric method, in titrating the alkaloid, on account of the difficulty in purifying the alkaloids without loss. The various other manipulative details are given quite fully, and three processes are outlined for carrying out the plaster assay. Parts of Williams' method are embodied in the present official assay process.

In a private communication, the late Mr. Williams mentioned that he was using a specially adapted centrifugal machine to break up emulsions, whereby he hoped to perfect a simplified process of assay.

Carl E. Smith, in *The American Journal of Pharmacy*, April, 1898, published a method of assay for belladonna plaster which contained some suggested improvements over the Williams and Parker method.

Bennett F. Davenport, in an article in *Red Cross Notes*, Series II, No. 3, 1898, page 10, entitled "Difficulties in the Assay of Belladonna Plasters," stated that "The most generally approved shakeout methods of assay for alkaloids in belladonna plaster, when made with a rubber mass, have certain practical difficulties inherent in the solvents and precipitants used, which render them very liable to yield erroneous results." To eliminate the persistent emulsions formed when the chloroform-alcohol solution is extracted with weak sulphuric acid, he recommended the evaporation of that solution to remove the alcohol, and then redissolving in chloroform, from which the alkaloids are extracted with weak acid in the usual manner. Davenport was also aware of the fact that heat causes loss of alkaloid.

There are difficulties to be encountered in the assay of belladonna plasters, which an analyst experienced in other types of assay would not suspect. In the assay of a plaster one is dealing with a mixture of india-rubber, resin, waxes, pitch and other ingredients. The first precipitation of the rubber from the chloroformic solution of the mass is apt to occlude some of the alkaloids, hence the advisability of redissolving the precipitated rubber mass in a measured amount of chloroform and reprecipitating with exactly four-fifths of its volume of 95% alcohol.

The large bulk of chloroform-alcohol mixture, containing the alkaloids, is extracted with some difficulty. Hence, the advisability of removing nearly all the alcohol by careful evaporation, and then taking up with a fresh portion of chloroform, from which the alkaloids are extracted with 0.5% sulphuric acid, until a portion, when tested with Mayer's Reagent, no longer gives a test for alkaloids. Should there be any alcohol present, it would tend to have a solvent action on the iodohydrargyrate of the alkaloids, and not give the characteristic precipitate.

The mere extraction with the prescribed amount of chloroform in the final extraction, does not necessarily insure the complete removal of the alkaloids. It is good practice to test the third or fourth portion by the evaporation of 1 cc., dissolving in dilute acid and testing with mercuric potassium iodide.

In some respects the eighth edition of the U. S. P. gives more specific directions than the present volume. As an example, the term "weak sulphuric acid," which is employed, is somewhat vague. The eighth edition stated very definitely that 40 parts of normal sulphuric acid, volumetric solution, were to be mixed with 60 parts of distilled water. Sulphuric acid, 0.5% seems to be the strength to use in making the acid shakeouts. Prior to the issuance of the corrections to the present Pharmacopœia, water was directed to be used in extracting the alkaloids from the chloroform-alcohol mixture after precipitation of the rubber. This resulted in the formation of very obstinate emulsions, and this part of the process had to be abandoned, using instead 0.5% sulphuric acid.

In the evaporation of the final chloroformic solution, prolonged heating on the water-bath is to be guarded against. Too much heat results in the transformation of the alkaloids, thereby producing low results. In the final chloroform evaporation, it is advisable to add two or three 1 cc. portions of chloroform to the brownish residue and carefully evaporate, using a current of air to remove the last traces of chloroform. In this manner, any remaining traces of ammonia are eliminated. The eighth revision of the U. S. P. advocated the use of ten drops of chloroform in dissolving the final residue after adding the 5 cc. of tenth-normal sulphuric acid. This dissolves any extractive matter which may have been carried through, and which would not otherwise so readily yield the alkaloid to the dilute acid. However, the chloroform must be completely evaporated from the acid solution, as it interferes with the indicator in titrating. After the alkaloidal residue is dissolved by the tenth-normal acid, dilute with about 50 cc. of cold distilled water.

Methyl red is by far the best indicator for titrating and it is now employed almost entirely in place of cochineal. Two or three drops of the test solution are sufficient.

Critical points to be observed in the assay are:

a. Precipitation of the rubber from the chloroformic solution with exactly four-fifths its volume of alcohol.

b. Complete extraction of the alkaloids from the precipitated rubber mass, and at every other stage of the assay process.

c. Careful evaporation of the final chloroformic solution, and dispelling all traces of ammonia. Prolonged heating to be avoided, as it produces low results.

d. Complete solution of the alkaloids from the final residue in the tenth-normal sulphuric acid.

Notwithstanding the fact that belladonna plaster is a little troublesome to assay, the deterioration of the alkaloidal strength is very slow. The rubber base is ideal, in that while it permits ready absorption of the medication, it also acts as an excellent preservative for the belladonna alkaloids.

In the abstract of proposed changes in the tenth revision of the U. S. P., Part VII (JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, Novem-

ber, 1924, page 1054), the proposed assay process for Emplastrum Belladonnæ appears as follows, except that we have inserted therein our suggestions in italics:

> Emplastrum Belladonnæ. Assay.—Introduce (*about*) 10 Gm. of Belladonna Plaster (*accurately weighed*) into a 100-cc. flask. (If the plaster is spread on fabric, cut the portion to be assayed into strips, weigh accurately, and introduce it into the flask.) Now add 50 cc. of chloroform, and shake the mixture until the plaster is dissolved. Pour the chloroform solution into a 250-cc. beaker and wash the cloth upon which the plaster was spread with two portions of 25 cc. each of chloroform, adding the washings to the chloroform solutions in the beaker. Then wash this cloth with 80 cc. of alcohol containing 1 cc. of ammonia T. S. and pour the washings into the chloroform solution in the beaker. Stir the mixture gently and allow it to stand until the rubber has separated into a compact mass. Dry cloth upon which the plaster was spread, weigh it and subtract its weight from the original weight of the plaster. Pour the chloroform-alcohol solution into a 250-cc. separator, rinse the beaker and rubber with 10 cc. of alcohol and add the rinsing to the separator. Completely extract the alkaloids from the chloroform-alcohol solution by shaking it out repeatedly with weak (*strike out the word "weak" and insert 0.5 per cent.*) sulphuric acid. Collect the cold (*strike out the word "cold"*) washings in a separator and add ammonia T. S. until the solution is decidedly alkaline to litmus paper, and completely extract the alkaloids by shaking out repeatedly with chloroform. Filter the chloroform solution through a pledget of purified cotton, evaporate it to dryness and dissolve the alkaloids from the residue in exactly 5 cc. of tenth-normal sulphuric acid, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using cochineal (*strike out the word "cochineal" and insert methyl red*) T. S. as indicator. Each cc. of tenth-normal sulphuric acid consumed corresponds to 0.02893 Gm. of the alkaloids from belladonna leaves.

ASSAY OF BELLADONNA PLASTER CONTAINING LEAD OLEATE BASE.

Belladonna plaster made with a lead oleate base is not adapted to the same method of assay as the present U. S. P. plaster. Allen's "Commercial Organic Analysis" gives the following method of assay:

> "Fifteen grams of the plaster are dissolved with gentle heat in a mixture of 35 cc. of chloroform and 5 cc. of glacial acetic acid; 70 cc. of 4% sulphuric acid are added, and the mixture warmed and stirred. It is filtered under pressure and the cake of lead sulphate disintegrated and warmed with a mixture of chloroform 10 cc. and 4% sulphuric acid, 10 cc., and again filtered; the chloroform layer is separated from the mixed filtrates and washed twice with 5 cc. of 4% sulphuric acid. The mixed aqueous portions are then rendered alkaline with ammonia and extracted with chloroform, and again shaken into acid and back into chloroform, proceeding as in the assay of other belladonna preparations."

The acetic acid liberates the fatty acids from the soap and decomposes the lead oleate. The chloroform dissolves the fatty acids thus liberated, as well as the resin. The lead is converted into insoluble lead sulphate and removed, while the alkaloids are extracted in the acid menstruum.

The method given in Allen's Commercial "Organic Analysis" is one published by F. C. J. Bird in the *Analyst*, February, 1899.

In the same year, H. J. Henderson presented a paper before the British Pharmaceutical Conference entitled, "The Assay of Belladonna Plaster, B. P., 1898." The details of this process are as follows:

> "Weigh 5 grams of the plaster and introduce it into a stoppered glass separator with 25 cc. of ether; allow the plaster to disintegrate. When the contents of

the separator present the appearance of an emulsion, add 5 cc. of a mixture of glacial acetic acid and water (3 parts of the former to 2 parts of the latter), shake for thirty seconds, and set aside until the acid liquor has completely separated. Draw off the lower layer into a small beaker, and again agitate the ether solution with 5 cc. of the dilute acetic acid of the B. P., and draw off as before. To the united acid liquors in the beaker, add dilute sulphuric acid in excess, stir well, and allow the sulphate of lead to subside. Filter and wash lead precipitate with distilled water until a drop of the filtrate gives no precipitate with Mayer's Reagent. Concentrate the washings to a small bulk, and add these to the contents of the separator."

The remainder of the process consists in following the usual procedure of making alkaline with ammonia and extracting with chloroform. The chloroform extract is purified by shaking with dilute hydrochloric acid, and then neutralizing this acid solution of the alkaloids with ammonia and extracting with chloroform. The chloroform residue is dried and weighed.

Frank X. Moerk published a method for the assay of the Emplastrum Belladonnae U. S. P., 1890, in *The American Journal of Pharmacy*, March, 1899. In this method sulphuric acid is used to convert the lead oleate into insoluble lead sulphate and also to liberate the fatty acids from the soap, thus eliminating these two ingredients. The author used a few milligrams of stearic acid to overcome the persistent emulsions formed when extracting the alkaline solution with chloroform-ether mixture. He found that the stearic acid did not interfere with the accuracy of the results.

The difference between the assay process for plasters containing lead oleate and soap, and the present official plaster which does not contain these ingredients, is the procedure involved in getting rid of these interfering substances. This was accomplished in the different methods by the use of sulphuric and acetic acids. The present U. S. P. method of assay is designed to eliminate the rubber, so that the belladonna alkaloids may be more readily and completely extracted. Although the final object sought is the same, the methods must of necessity differ according to the interfering substances present. Also the judicious use of the miscible solvents eliminates to a great extent the troublesome emulsions.

CONCLUSION.

The alkaloidal standard for Belladonna Plaster adopted by the United States Pharmacopœia, Revision IX, has proven satisfactory, and is quite in conformity with the leading Pharmacopœias of the world.

The assay process found in Revision IX, U. S. P., with the very slight modifications suggested, will be found to give satisfactory results.

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WHY BOTANY AND PHARMACOGNOSY?

BY WILLIAM J. STONEBACK, PH.G.

Some time ago, while entertaining two brother-pharmacists, one of them asked—"Why lay so much stress on Botany and Pharmacognosy in the colleges of pharmacy? Doctors are not prescribing crude drugs and very few of their preparations. It seems a waste of time to require students to study Botany and