tremely simple and the propagation of belladonna now fairly well developed. Much difficulty has been experienced, however, in the seeding and transplanting of henbane and in the elimination of insects from the growing plants. In the second place it is extremely doubtful whether any binennial forms can be grown profitably in this country if the second year product is demanded. In my estimation such a demand cannot be based upon strictly economic and scientific principles. The henbane situation for the past three years has demonstrated that conditions may arise which will make it not only advisable but probably necessary to pursue a vigorous search for pharmacopœial substitutes. I have demonstrated repeatedly that much of the commercial henbane is not from Hyoscyamus niger of the second year's growth and further-more first year leaves of biennial henbane have been tested which yielded 0.089 percent of alkaloids. This figure is only suggestive but should be an incentive to further investigations upon the production of an annual crop of this drug. As yet however, the uncertainty of the plant under cultivation does not warrant an attempt at commercial productions. The experimental stage has not been passed, and so long as this condition exists little can be said for prospective growers in the nature of direct and specific recommendations.

The foregoing conditions apply not only to henbane but in my estimation to most of the important drug plants now under investigation within the United States. The mere fact that a form is grown experimentally or for garden or decorative purposes does not signify that it can be produced successfully upon a commercial scale. The production of a few specimen plants does not involve field conditions and is no indication of the ease and rapidity with which the same form may be grown commerically. Commercial possibilities have been suggested upon these grounds and the much talked of "profit in weeds" has resulted in more talk than profit. It is now time to reduce the work on drug cultivation to an exact science, and to determine the commercial possibilities of the most promising forms in the same manner as has been done for agricultural and other economic forms. When this has been accomplished there will be ample time for recommendations to practical growers. Until then all inquiries should be met with a clear statement of the uncertainty of immediate commercial possibilities together with an idea of the exacting nature of the requirements for the various classes of medicinal plants.

BOTANICAL DEPARTMENT, ELI LILLY & COMPANY, INDIANAPOLIS, Aug. 4, 1913.

A BIBLIOGRAPHY OF THE DETERIORATION OF DRUGS AND PHARMACEUTICAL PRODUCTS.

E. G. EBERHARDT AND F. R. ELDRED, INDIANAPOLIS, IND.

The term deterioration is here restricted to the decrease of therapeutic value by decomposition or loss of active constituents. It is only in recent years that the matter of the deterioration of drugs and their preparations has received any considerable attention. At least practically all of the systematic work on the subject is of comparatively recent date. The older results were mostly inci-

dental to work along related lines, principally that of standardization. A study of the subject discloses the need of accurate and decisive work as there is still much of uncertainty and diversity of opinion. The importance of the subject and the great advances made in the matter of standardization justifies the hope that the near future will see a marked increase of our knowledge in this field.

We do not presume to offer this as a complete bibliography of the subject, but we have tried in the time at our disposal to make it sufficiently so to give a very fair review of the field. Many references could be seen in abstract only but were considered definite enough to merit inclusion.

It is our purpose to continue the bibliography and to publish additional references after a sufficient interval.

Aconite, The Assay of,—A. B. Stevens,—Bull. Phar., 1911, Vol. 25, p. 237. Also Phar. Jr., Vol. 87, p. 33.
Properly kept the drug does not deteriorate. Chemical assay will detect deterioration.

Aconite, The Effects of Medicinal Doses of, upon the Pulse Rate,—R. D. Rudolph and E. C. Cole,—Am. Jr. Med. Sci., 1912, Vol. 144, p. 788.
Tinctures on the market are usually inert. A large loss of activity observed in aconitine solution in four months.

Alkaloidal Extracts, The Stability of,—H. M. Webster,—Chem. Drugg., 1908, No. 1487, p. 172, through Chem. Absts. Vol. 2, p. 2969; also Proc. A. Ph. A. Vol. 57, p. 73.
Difference found in extracts after two to twenty-five years did not exceed limits of experimental error.

Alkaloidal Fluidextracts and Tinctures, On the Permanence of,—W. L. Scoville,—Proc. Am. Ph. Assn., 1910, Vol. 58, p. 874.
A series of preparations was assayed at intervals of three months during one year. Tabulated results are given.

Alkaloidal Stability of Certain Standardized Preparations of the Br. Pharmacopœia,—W. A. H. Naylor and C. Huxtable,—Pharm. Jr., 1902, Vol. 69, p. 134.
Show from 1% to 5% of depreciation in eight months.

Alkaloidal Tinctures, Stability of,—Farr and Wright,—Phar. Jr., 1894, p. 123, through Proc. A. Ph. A., Vol. 43, p. 622.
The only notable loss observed was in tinctures cinchona and green hellebore and then not exceeding 5% average.

Astringent Preparations, Permanence of,—Wilbur L. Scoville,—Jr. A. Ph. A., 1912, Vol. 1, p. 334.
Tannin estimation made in the fluidextracts of a number of drugs at intervals during the three years show marked changes.

Belladonna Leaves, The Quality of,—A. B. Lyons,—Proc. A. Ph. A., 1886, Vol. 34, p. 110.
Concludes that leaf kept in pressed packages for several years shows no evidence of loss.

Belladonna Extract, Keeping Qualities of,—Holger Thaysen,—Schweiz. Wochschr., Vol. 50, p. 605; also Apoth. Ztg., 1912, p. 528; through Chem. Absts. Vol. 7, p. 681.
Alkaloids remain unchanged.

Calcium Sulphide Pills and Tablets,—M. R. Schmidt & H. Engelhardt,—Proc. A. Ph. A., 1910. Vol. 58, p. 1005.
No noticeable deterioration in three year old preparations.

Cannabis Indica, Notes on,—E. M. Holmes,—Phar. Jr. 1902. Vol. 68, p. 342.
Suggests advisability of storing as tincture instead of the drug, to avoid deterioration.

Cannabis Indica and its Galenical Preparations, Physiological Assay of, with Notes on some of the Commercial Products Supposed to Represent the Active Principles of the Drug.—L. W. Famulener and A. B. Lyons.—Proc. A. Ph. A., 1903. Vol. 51, p. 240.
The drug loses activity especially when powdered, likewise the powd. ext. The solid and fluidextracts are permanent.

Cherry-Laurel Water, The Stability of,—H. Ribaut,—Bull. Sci. Pharmacol. Vol. 17, p. 583; through Chem. Absts. Vol. 5, p. 2895.
HC.N. content decreases irregularly with time.

Cinchona, Note on the Use of Fl. Ext., for Making Wine of Cinchona,—G. Allard & A. Nourrisson,—Jr. Pharm. Chim. Series 7, Vol. 6, p. 21; through Chem. Absts. Vol. 7, p. 1260.
The alkaloidal strength of the fluid extract diminishes with time.

Coca Leaves, Notes on the Alkaloids of,—A. B. Lyons,—Am. Jr. Phar., 1885. Vol. 57, p. 466.
States the leaves rapidly deteriorate.

Coca, A Lecture on, delivered at the Phil. Coll. Pharm., Dec. 1, 1887, by H. H. Rusby,—Am. Jr. Phar., 1888. Vol. 60, p. 199.
Attention is called to the changes occurring during importation.

Coca and Cocaine Studied Historically,—Sharpe,—Pharm. Jr. Vol. 82, p. 185.
The drug is readily affected by dampness and rendered inert.

Commercial Crude Drugs, The Variation in Activity of,—F. H. Carr & W. C. Reynolds,—Pharm. Jr., 1908. Vol. 80, p. 543.
Attention is called to the influence of enzymes, in many cases causing loss of activity.

Digitalis, Activity of Leaves and Stability and Standardization of Tinctures,—Gordon Sharp and F. W. Branson,—Phar. Jr., 1912. Vol. 59, pp. 131, 173. (Abst.) Jr. A. Ph. A. Vol. 1, p. 1431.
Of a number of tinctures, part were found deteriorated at 20 months and nearly all after 28 months.

Digitalis and Ergot Preparations, Reliability of,—Jr. Am. Med. Assn., 1912. Vol. 58., p. 705
Editorial advocating dating of the preparations named.

Digitalis and Its Preparations, Deterioration of,—Drug. Cir., 1912. Vol. 56, p. 737.
Answer to a query.

Digitalis and Its Preparations, The Keeping Properties of,—Jr. Am. Med. Assn., 1913, Vol. 61, p. 202.—Editorial.

Digitalis and Some of Its Preparations, Observations on the Keeping Properties of,—R. A. Hatcher & C. Eggleston,—Jr. Am. Pharm. Assn., 1913. Vol. II, p. 876, also Am. Jr. Phar. Vol. 85, p. 203.
Leaves of good quality in many instances do not deteriorate with age. When they do it is with exceeding slowness. The same is true of preparations containing 50% or more of alcohol.

Digitalisblätter, Die Physiologische Wertbestimmung der,—Dr. C. Focke,—Arch. d. Pharm., 1903. Vol. 24, p. 128.
Moisture and air are the prime factors causing deterioration.

Digitalisblätter, Wertbestimmung der,—H. Ziegenbein,—Arch. der. Pharm., 1902. Vol. 240, p. 454.
Activity is reduced by storage for several years, 40% to 60%.

Digitalis, Factors Relating to the Standardization of,—Worth Hale,—Proc. Am. Ph. Assn., 1909. Vol. 57, p. 769.
The paper discusses in a general way the variability of the drug and its preparations.

Digitalis, Infusion of, Deterioration dependent on Acidity,—J. Löwy,—Phar. Ztg., 1906. Vol. 51, p. 1074; through Proc. A. Ph. A. Vol. 55, p. 663.
Infusion loses half its activity in 24 hours at room temperature. Neutralization prevents the change.

Digitalis, Infusion of, Preservative Effect of Small Percentages of Alcohol,—C. Focke,—Pharm. Ztg., 1909. Vol. 54, p. 757; through Proc. A. Ph. A. Vol. 58, p. 90.
5% alcohol renders it stable within reasonable limits, with 10% alcohol deterioration in nine months is not over 5 to 10%.

Digitalis, The Alteration of Infusions of, through the action of Micro-organisms and the Preservation of Infusions.—A. Hoger,—Giorn. Farm. Chem. Vol. 61, p. 19; through Chem. Absts., 1912. Vol. 6, p. 913.
Addition of 5% alcohol acts as a preservative and does not impair activity.

Digitalis, Its Cultivation, Collection and Preparation,—Edwin L. Newcomb,—Am. Jr. Ph., 1912. Vol. 84, p. 201.
Reviews opinions as to influence of drying on preventing deterioration.

Digitalis, Keeping Properties of,—Brissemoret & Joanin, —Jr. Pharm. Els-Lothr., 1911, p. 221; through (abst.) Phar. Era, 1912. Vol. 45, p. 13.
Dried leaves kept their activity for 8 to 11 years. Tincture begins to deteriorate after 13 months and is nearly worthless after 15 months.

Digitalis Leaves, Value of Air-tight Preservation,—Caesar and Loretz,—Phar. Ztg., 1904. Vol. 49, p. 791; through Proc. A. Ph. A. Vol. 53, p. 630.
Preserved unimpaired for one year.

Digitalis, Method of Collection, Preservation and Dispensing,—A. Wolff,—Phar. Zentralh., 1903. Vol. 44, p. 585; through Proc. A. Ph. A. Vol. 52, p. 659.
It is suggested the thoroughly dried and powdered drug be preserved compressed in tablet form, protected from air.

Digitalis Powder, Commercial, and Its Preservation,—A. Joanin,—Bull. Sci. Pharmacolog. Vol. 17, p. 707; through Chem. Absts., 1911. Vol. 5, p. 3717; also Proc. A. Ph. A. Vol. 59, p. 181.
The drug should be dried so as to contain not over 2% of moisture, powdered and kept protected from moisture.

Digitalis Preparations, Are Druggists Paying Attention to Deterioration of,—Jr. A. Ph. A. Vol. 1, p. 1453.
A communication to the Editor by Wm. Gray.

Digitalis Preparations, On the Importance of Determining the Potency of,—Joseph H. Pratt, —Bost. Med. & Surg. Jr., 1910, Vol. 163, p. 279.
A review of clinical and experimental evidence showing wide variations of activity in different samples.

Digitalis Preparations, The Efficiency of,—Med. Rec., 1907, Vol. 71, p. 356.
Editorial.

Digitalis, Report of A. Ph. A. Committee on Drug Market,—Jr. Am. Phar. Assn., Vol. 1, p. 500.
Assays of powder over eighteen months old showed no appreciable change.

Digitalis, Some Points as to Time of Gathering of the Leaves and the Keeping Properties and Standardization of the Tinctures, etc.—Gordon Sharp & J. Lancaster,—Phar. Jr., 1911, Vol. 86, p. 102.
Tincture begins to deteriorate after thirteen months. Leaves eight and eleven years old were still potent.

Digitalis, Standardization and the Variability of Crude and of Medicinal Preparations,—Worth Hale,—Bull. No. 74, Hygienic Lab., U. S. Public Health & Mar. Hosp. Service—1911.
A study of the drug and a number of its preparations as to potency and stability.

Digitalis, Strophanthus and Squill Preparations, Keeping Qualities of,—Alexander Goodall,—Phar. Jr., 1912, Vol. 89, p. 130; (abst.) Jr. Am. Ph. A., Vol. 1, p. 1435; also Am. Drug., Vol. 60, p. 353.
Tincture Digitalis was found to deteriorate after one year. Of samples of tinctures of strophanthus and squill some were found to deteriorate after three years.

Digitalis, The Physiological Activity of Acetic Fluidext. of,—Pearson,—Am. Jr. Ph., 1913, Vol. 85, p. 245.
The acetic menstruum quickly destroys potency.

Digitalis, The Physiological Standardization of, from the Point of View of the Pharmacist,—Robt. R. Hallaway,—Phar. Jr., 1909, Vol. 83, p. 801.
Concludes that six months is a safe time limit for the tincture.

Digitalis, The Variability of,—Hale,—Proc. Am. Ph. Assn., 1910, Vol. 58, p. 925.
Excessive drying of drug not required. Preparations seem to deteriorate little if made with 70% alcohol.

Digitalis, Tr., Its Potency and Keeping Properties,—Alexander Goodall,—Br. Med. Jr., 1912, Vol. I, p. 887; through Am. Jr. Med. Sci., Vol. 144, p. 299, 1912; also Chem. Absts., Vol. 7, p. 536.

Tinctures retain activity for about one year, after 18 months some are under standard, and after 22 months all of them.

Digitalis, Tincture of, Necessity of Protection from Light,—C. Focke,—Phar. Ztg., 1904, Vol. 49, p. 543; through Proc. A. Ph. A., Vol. 53, p. 599.

If kept in the dark deterioration amounts to 10% to 17%. If exposed to light, from 33% to 50% in one year.

Digitalis, Tincture,—Moran,—Med. Chronicle, 1911-12, Vol. 55, p. 1.

Tinctures tested from four to twenty years old. A tincture of Digitalis should retain its activity for two or three years. (Seen in reference only.)

Digitalis, Ueber die Bestimmung des Pharmakologischen Wirkungswertes der Blätter von,—Arnold Holste,—Arch. Exp. Path., 1911, Vol. 66, p. 161.

No change apparent in relative activity after approximately one year.

Digitalis, Ueber den Wert der Frischen Fol., und ihre Konservierung,—M. Winckel,—Münch. Med. Wochenschr., 1911, Vol. 58, p. 575.

Permanence is claimed for powdered drug in tablet form, prepared by preventing the action of enzymes in the fresh leaf.

Diluted Hydrocyanic Acid, The Deterioration of,—Virgil Coblentz and Otto May,—Proc. Am. Phar. Assn., 1908, Vol. 56, p. 879.

Experiments to determine the influence of light, alkali, acid, alcohol and acetanilid on decomposition.

Drug Deterioration—Texas State Jr. of Med., 1912, p. 159; through Jr. A. Ph. A. 1913, Vol. II, p. 82.

Editorial in support of dating preparations.

Drug Extracts of Various Kinds, Report of Committee of Pharm. Chemists Appointed for the Investigation of, to Determine their Rate of Deterioration. 1908.

A compilation of reports of investigations from a number of manufacturing laboratories.

Drug Extracts, Stability of,—A pamphlet containing report on deterioration from the laboratories of a number of manufacturing pharmacists,—1907-8.

Drugs, Short Notes on the Deterioration of, and Suggestions for the Prevention thereof,—J. S. Hill,—Phar. Jr., 1904, Vol. 72, p. 652.

Brief general discussion of agencies causing deterioration.

Drugs, Some Experiences in the Testing of, by Bio-Chemical Methods, with Special Reference to Digitalis, Squill and Strophanthus,—Wm. Martin,—Pharm. Jr., 1909, Vol. 83, p. 149.

Digitalis drug if properly prepared and stored, retains activity for many years and the tincture for nine or twelve months. Tinct. Squill begins to deteriorate sooner than digitalis, but the change is slower. Tinct. Strophanthus remains unimpaired for many years.

Drugs, The Bio-Chemical Standardization of,—W. E. Dixon and G. S. Haynes,—Proc. Therap. Soc., 1905; through Pharm. Jr., Vol. 75, p. 754.

The variability of commercial tinctures may be due to deterioration. Standard tinctures were unchanged after eight months.

Drugs, The deterioration of,—Jr. Am. Med. Assn., 1912, Vol. 59, p. 959.

Communication from the Council on Pharmacy and Chemistry of the A. M. A., recommending the dating of certain preparations.

Drugs, The Preservation of,—Linwood A. Brown,—Bull. No. 150, Ky. Agr. Exp. Sta. of the State Univ.

Discusses the storage of crude drugs and various pharmaceutical preparations.

Ergot,—R. Kobert,—Central. f. Gynäkol., 1886, Vol. X, p. 306.

Concludes that Ergot more than a year old has no action on the uterus. (Seen in reference only.)

Ergot,—Kehrer,—Arch. f. Exp. Path. u. Pharm., 1908, Vol. 58, p. 366.

Within one year the activity sinks to 1/7 of the original strength and in two years to 1/5. (Seen in reference only.)

Ergot, An Experimental Study of the Pharmacology of,—Wood & Hofer,—Arch. Int. Med., 1910, Vol. 6, p. 388.
A fluid extract exposed to air deteriorates extremely rapidly. Under the most favorable conditions the loss of strength approximates 10% a month.

Ergot; A Symposium,—Jr. Am. Phar. Assn., 1912, Vol. 1, p. 653.
A discussion of various phases of the subject at the meeting of the N. Y. Branch of the Am. Phar. Assn., May 13, 1912, by H. H. Rusby, C. E. Vanderkleed and Cornelius De Jonge.

Ergot, Enzymes in,—J. Schindelmeyer,—Apoth. Ztg., 1909, Vol. 24, p. 837; through Chem. Absts., Vol. 4, p. 1083; also Proc. A. P. A., Vol. 58, p. 157.
As complete and rapid drying prevents deterioration, this may be caused by enzymes, the presence of two being demonstrated.

Ergot, Experiments on Deterioration of,—Meulenhoff,—Nederl. Tijdschr. v. Pharm. (abst.) Phar. Rundsch., 1900, Vol. XXVI, pp. 738-772.
Believes that ergot under suitable conditions retains considerable activity for five years. (Seen in reference only.)

Ergot, How long does Liquid Extract of, Retain its Pharmacological Activity,—Phar. Jr., 1908, Vol. 80, p. 82.
By clinical trial no deterioration was apparent after one year. It is not necessary that ergot preparations be kept longer than twelve months.

Ergot, Intravenous Injection of,—Sollman and Brown,—Jr. Am. Med. Assn., 1905, Vol. 45, p. 229.
Comparisons were made of eleven different preparations of ergot, both fresh and old. Age of drug seems to make no difference.

Ergot; Its Production and Collection in Russia,—D. A. Ruffman and T. Maben,—Pharm. Jr., 1908, Vol. 80, p. 247.
Effect of age on ergot is discussed.

Ergot Preparations, A New and Reliable Method for the Preservation of,—Paul S. Pittinger and Chas. E. Vanderkleed,—Jr. Am. Phar. Assn., 1912, Vol. 1, p. 799.
Contact with air is the most potent cause of deterioration. A vacuum method of storage will preserve for a considerable time.

Ergot, Preservation of,—Dragendorff,—(abst.) Proc. Am. Phar. Assn., 1877, Vol. 25, p. 119.
The oxidation of the fat causes deterioration; would retain activity if fat were removed.

Ergot, Fluidext., Relative Strength of Fresh and Old Samples of,—C. C. Haskell and C. R. Eckler,—Jr. Am. Phar. Assn., 1912, Vol. 1, p. 412.
Properly kept fluid extract retains activity for two to two and one-half years, after which deterioration becomes apparent, amounting to 50% in four or five years.

Ergot, Stability of Pressed,—John Moss,—Yearbook of Phar., 1885, p. 410; through Proc. Am. Phar. Assn., 1886, Vol. 34, p. 371.
A sample of ergot, pressed to remove oil, retained its potency for six and one-half years.

Ergot, Stability of when Deprived of Fixed Oil,—Hermann Werner,—Phar. Ztg., 1881, p. 397; through Proc. Am. Phar. Assn., 1882, Vol. 30, p. 142.
Ergot so treated kept its virtues unimpaired for two years or more.

Ergot, Standardization of,—H. C. Wood and C. A. Hofer,—Univ. of Pa. Med. Bull., 1909, Vol. 21, p. 347.
Of twelve fluid extracts examined two were active. Both drug and fluid extract deteriorate rapidly.

Ergot, The Chemical Assay of Fluidextract of,—J. R. Rippetoe,—Am. Jr. Phar., 1910, Vol. 2, p. 119.
There is marked difference between fresh and old preparations.

Ergot and Its Fluidextracts, The Keeping Qualities of,—H. C. Wood, Jr.,—Am. Jr. Phar., 1911, Vol. 83, p. 172.
Fluidextract deteriorates rapidly, from 1.3% to 3.5% per week, according to conditions. Should not be kept longer than one year.

Ergot, The Physiological Standardization of,—C. W. Edmunds and Worth Hale,—Bull. No. 76, Hygienic Lab., U. S. Pub. Health and Mar. Hosp. Service, 1911.
Fluidextracts vary greatly. Preparations should be marked with date of manufacture.

Ergot, The Rate of Deterioration of Fluidext. of,—Wood.,—Proc. Am. Ph. Assn., 1910, Vol. 58, p. 883.
Fluidextract under the most favorable conditions loses 45% to 50% in the first year. Under unfavorable conditions the same loss occurs in three months.

Extracts, Belladonna and Henbane, Variation of Alkaloid on Keeping,—G. Ortlieb,—Phar. Ztg., 1903, p. 162; through Proc. Am. Phar. Assn., Vol.. 51. p. 621.
Alkaloidal value diminishes on keeping.

Extracts, Variation of Alkaloids in Some,—Jean Fricotel,—Bull. Sci. Pharmacolog., 1908, Vol. 15, p. 687; through Chem. Absts., Vol. 4, p. 234; also Proc. A. Ph. A., Vol. 57, p. 73.
Moist extracts show decrease in alkaloid after eight months in conium, belladonna, stramonium, opium and aconite.

Fluidextracts, Value of Glycerin as Solvent and Preservative,—Richard Firlas,—Apoth. Ztg., 1909, Vol. 24, p. 721; through Proc. Am. Phar. Assn., Vol. 58, p. 85.
Alkaloid diminishes more rapidly in fluidextracts made without glycerin.

Folia Belladonna, F. Hyoscyami u. F. Stramonii, Ueber die Aufbewahrungsdauer von,—R. Gaze,—Apoth. Ztg., 1912, p. 402; through Phar. Zentralh., Vol. 53, p. 1406.
The powdered drugs were kept in glass-stoppered bottles at room temperature and assayed at intervals during two years showing no loss.

Galenical Preparations Containing Alkaloids, Stability of,—Dohme & Engelhardt,—Proc. Am. Phar. Assn., 1910, Vol. 58, p. 782.
All fluidextracts tested keep their alkaloidal strength well, excepting those of coca and physostigma.

Galenical Preparations of the U. S. P., Detailed Investigations of Certain, with Special Reference to their Stability,—Dr. M. Clayton Thrush,—Pharm. Era, 1912, Vol. XLV, p. 750.
A general discussion of results obtained by others with conclusions by the author.

Galenical Preparations, The Stability of,—Dohme,—Am. Drug., 1909, Vol. 55, p. 37.
A number of products of various ages were assayed. No appreciable deterioration found except in powd. ext. physostigma, fluidextracts of coca and aconite and tincture aconite.

Galenicals, Deterioration of,—Phar. Era, 1912, Vol. 45, p. 741. Editorial.

Galenicals, The Potency and Keeping Properties of Some, as Determined by Physiological Tests,—Alexander Goodall,—Phar. Jr., 1912, Vol. 89, p. 130.
Tincture digitalis not reliable after one year. Tr. strophanthus retains activity at least three years. Tr. squill may deteriorate after two years.

Heart Tonics, The Pharmacological Assay of,—Houghton & Hamilton,—Proc. Am. Ph. Assn., 1909, Vol. 57, p. 773; also Am. Jr. Phar., Vol. 81, p. 461.
An investigation of the potency of preparations of digitalis, squill, convallaria and strophanthus, showing loss with age in digitalis.

Hydrastis, Ausscheidungen in Extractum Fluidum,—C. Linde,—Arch. d. Phar., 1898, Vol. 236, p. 698.
The precipitate deposited in fluidextract consists principally of berberin and hydrastin.

Hydrastis, Extractum, Fluidum,—Kunze,—Apoth. Ztg., Vol. 28, p. 223; through Chem. Absts., 1913, Vol. 7, p. 2089.
A specially prepared sample changed from 2.86% hydrastine to 2.19% in one year.

Hydrastis, Fluid Extract of,—L. Derlin,—Apoth. Ztg., Vol. 25, p. 190; also G. Fromme Ibid, Vol. 25, pp. 250, 274, 303; through Chem. Absts., Vol. 4, p. 1894.
The alkaloidal content of five samples out of six did not change more than .1% within six to twelve months.

Hydrogen Dioxide at Present on the Market, The Quality of Medicinal,—Kebler,—Proc. Am. Ph. Assn., 1910, Vol. 58, p. 903.
Investigation extending over one year showing progressive loss of strength.

Hydrogen Dioxide Solutions, Examination of,—L. F. Kebler, L. E. Warren and E. A. Ruddiman,—Bull. 150, Bu. Chem., U. S. Dept. Agriculture.

Hydrogen Peroxide,—C. B. Jordan,—Proc. Ind. Phar. Assn., 1912; also Jr. Am. Phar. Assn., Vol. 2, p. 344.
Shows result of keeping under various conditions.

Hydrogen, Peroxide of,—A. R. L. Dohme and H. Engelhardt,—Am. Jr. Phar., 1910, Vol. 82, p. 69.
Discusses various means of preservation.

Hydrogen, Peroxide of,—Pharm. Era, 1913, Vol. 46, p. 1.
Editorial discussion giving number of conclusions.

Hydrogen Peroxide, Preservation by Acetanilide and Time Sale Limit,—Ph. Era, 1913, Vol. 46, p. 12.
A symposium of replies to queries sent out by the Era.

Hydrogen Peroxide, Production, Past and Present,—J. S. Brewer,—Jr. Am. Phar. Assn.. 1912, Vol. 1, p. 1002.
A general discussion of the subject.

Hydrogen Peroxide, Solution of, containing Acetanilide,—C. H. LaWall,—Am. Jr. Phar., 1906, Vol. 78, p. 582.
Calls attention to decomposition of acetanilide when used as preservative.

Hydrogen Peroxide Solution, Permanence and Acidity of,—L. W. Andrews,—Trans. Am. Inst., Chem. Eng., Vol. 2, p. 238; through Chem. Absts.. 1911, Vol. 5, p. 759.
Samples of poor keeping qualities lose 10% to 50%.

Hydrogen Peroxide Sol., Reliability of the Commercial Sorts,—Robert C. Purcel,—Proc. Pa. Phar. Assn., 1912, p. 143; through Proc. Am. Phar. Assn., Vol. 51, p. 610.
Shows deterioration in 6 months on four samples.

Hydrogen Peroxide, The Preservation of,—J. H. Walton and R. C. Judd,—Orig. Com. 8th Int. Cong. Appl. Chem. (Appendix), Vol. 26, p. 621 (Abst.)
A study of the influence of various factors on decomposition.

Indian Hemp, Experiments on the Cause of the Loss of Activity of,—C. R. Marshall,—Phar. Jr., 1909, Vol. 82, p. 418.
Oxidation is the cause of loss of activity. Cannabis and preparations should be stored in hermetically sealed containers.

Ipecac, A Study of, and Review of its Literature,—R. R. D. Cline,—Southern Phar. Jr., Vol. 4, pp. 11 and 56.
If kept in a cool dry place the drug retains its activity. The pharmaceutical preparations often deteriorate enormously.

Ipecac, Ext. Liquidum, B. P.,—J. W. Thompson,—Phar. Jr., 1900, Vol. 64, p. 54.
Finds liquid extract unchanged after 6 and 7 months.

Ipecacuanha, Stability of the B. P. Liquid Extract,—H. Wippell Gadd,—Chem. and Drug., 1901, p. 21; through Proc. Am. Phar. Assn., Vol. 49, p. 574.
The assay remains unchanged after four months in liquid extract, wine and vinegar of ipecac.

Ipecacuanha, The B. P. Preparations of,—R. Glode Guyer,—Phar. Jr., 1899, Vol. 63, p. 622.. Deterioration noted in liquid extract and other preparations.

Jodtinktur, Ueber die Haltbarkeit der,—L. Johannessen,—Pharm. Zentralh., 1913, vol. 54, p. 221.
Determinations of free I and acidity (HI) at intervals of one week in different tinctures. KI increases stability.

Medicinal Plants, Retrogression of Active Substance in, by the Action of Enzymes,—P. Lami, —Bull. Chim. Farm., 1911, Vol. 50, p. 835; through Chem. Abst., Vol. 6, p. 1809.
Suggests prevention of change by sterilization with hot ethyl or methyl alcohol vapors and subsequent drying.

Medicinal Plants, Sterilization and Drying of,—E. Bourquelot,—Jr. Pharm. Chim., Series 7, Vol. 3, p. 149, through Chem. absts., 1911, Vol. 5, p. 2412.
Loss of active substance by enzyme action amounted to 31% in aconite leaves, 21.7% in digitalis, 10% in aconite root, 26.4% in colchicum bulbs.

Medicinal Plants, Sterilization of. Abst. of a lecture delivered before the Academy of Medicine, Paris, by Prof. E. Bourquelot,—Phar. Era, 1912, Vol. 45, p. 599.
Alkaloid is lost through the action of ferments.

Mutterkornwirkung, Beiträge zur Kenntniss der,—A. Grünfeld,—Arb. d. Pharmakol. Inst., Dorpat, 1892, Vol. 8, p. 108. (Seen only in reference.)
Concludes that under ordinary conditions Ergot is worthless after 6 months.

Mutterkorns, Geburtsklin. Untersuch. u. d. Haltbarkeit. des,—A. Bishofsberger,—Diss. Bern., 1897. (Seen only in reference.)
The effects of one and two year old drugs was compared clinically, showing a moderate decrease of activity in the older drugs.

Narcotic Extracts, Study of Some,—E. Carlinfanti,—Bull. Chim. Farm., Vol. 51, p. 777; through Chem. Absts., 1913, Vol. 7, p. 1400.
Assays of extracts of aconite, belladonna, hyoscyamus and nux vomica show practically no change in two years.

Nitroglycerin in Tablets, Comments on Some Official Standards and Tests,—Henry L. Bernegau,—Am. Jr. Ph., 1907, Vol. 79, p. 555.
A number of lots of tablets showed no loss in nine months.

Nitroglycerin Tablets, Digitalin Tablets and Fluidextract Ergot, Physiologic Assay of,—C. H. Edmunds and Geo. B. Roth,—Jr. Am. Med. Assn., 1908, Vol. 51, p. 2130.
Nitroglycerin tablets lost none of their strength in two years. Fl. Ext. Ergot showed variation in strength. One sample apparently had deteriorated when retested after three months.

Opium, The Keeping Qualities of Powdered,—L. Debordeaux,—Jr. Phar. Chim., Series 7, Vol. 6, p. 491; through Chem. Absts., 1913, Vol. 7, p. 680.
Shows increase in insoluble morphine with age; also a decrease in total morphine apparently due to oxidation.

Pepsin and Pepsin Preparations, Systematic Observations on,— C. T. Nixon,—Proc. Am. Phar. Assn., 1910, Vol. 58, p. 1264.
Alcoholic preparations lost 10% activity in three weeks, 20% in five weeks, and were practically inert after one year.

Pepsin, Conservation of the Activity of, in Elixirs of Pepsin,—E. Thibault,—Jr. Pharm. Chim., Series 7, Vol. 1, p. 480; through Chem. Absts., 1911, Vol. 5, p. 1823.
Claims that pepsin is weakened by prolonged contact with alcohol stronger than 10%.

Pepsin, Effect of Alcohol is Solution of,—Eugene Thibault,—Jr. Pharm. Chim., Series 6, Vol. 15, p. 161; through Proc. Am. Phar. Assn., 1902, Vol. 50, p. 1081.
Shows marked diminution of peptic activity after prolonged contact with weak alcohol.

Pepsin, Lactated, Elixir of,—W. A. Pearson,—Proc. Am. Phar. Assn., 1909, Vol. 57, p. 905.
Tests made as to amylolytic and proteolytic activity. A preparation containing 15% alcohol shows only about one-half the theoretical pepsin strength after a few weeks.

Pepsin, Pancreatin and Combinations of these Ferments, Laboratory Studies of,—A. Zimmerman,—Jr. Ind. and Eng. Chem., 1911, Vol. 3, p. 750.
Pepsin and pancreatin with the proper degree of acidity can be kept in the same solution for at least two and one-half years, without injury to either.

Pepsin Solutions, Effects of Hydrochloric Acid on,—Liebmann & Johannssen,—Ugeskrift for Lager, 1911, No. 25; through Phar. Zentralh., Vol. 53, p. 263; also Phar. Era, 1912, Vol. 45, p. 313.
The presence of HCl causes loss of peptic activity proportionate to the acidity and the time of standing.

Pepsin, Stability of Peptonizing Power of Liquid Preparations of,—A. Petit and A. L. Petit,—Jr. Phar. Chim., Series 7, Vol. 1, p. 150; through Proc. A. Ph. A., Vol. 58, p. 393; also Chem. Absts., Vol. 4, p. 2977.
Experiments extending over more than six years show that elixirs and wines retain digestive power for years practically undiminished.

Pharmaceutical Preparations, Causes of Deterioration to be Avoided,—Leon C. Fink,—Bull. Phar., 1898, p. 105; through Proc. Am. Phar. Assn., Vol. 46, p. 652.
Deterioration may be avoided by proper care to avoid the influence of air, moisture, cold, heat and sunlight.

Pharmaceutical Preparations, Influence of Enzymes in the Production of,—M. Winckel,—Schweiz. Wochschr., Vol. 47, p. 705; through Chem. Absts., 1910, Vol. 4, p. 1085.
On the influence of the elimination of enzyme action in conserving digitalis and ergot.

Pharmaceutical Preparations, Note on the Loss of Strength of Some, by long Storage,—R. A. Cripp,—Ph. Jr., 1907, Vol. 78, p. 519.
Shows the results of tests at intervals on Acet. Scillae, Liq. Ammon. Fort., Liq. Ammon. and Tr. Quin. Ammon.

Phosphorized Oil, The Permanence of,—Hugo Korte,—Phar. Ztg., Vol. 53, p. 655; through Chem. Absts., 1909, Vol. 3, p. 98.
Under some conditions the phosphorous content diminished rapidly. Light seems to exert more influence than air.

Report of Analysis of Preparations under the Food and Drug Law,—L. E. Sayre,—Trans. Kansas Acad. Sci., Vol. 22, p. 100.
To answer the question as to what constitutes deterioration, Prof. Sayre proposes to define it as a deviation from the professed standard * * * as may be determined by microscopical, chemical and macroscopical examination.

Sanguinaria, Assay of Fluidextract of,—H. B. Meade,—Jr. Am. Phar. Assn., 1912, Vol. 1, p. 134.
The alkaloid content fell from 2.58 gm. per 100 cc. on Feb. 21 to 2.23 gm. on June 1.

Sarsaparillen, Ueber die Pharmakologische Bedeutung und die Biologische Wertbestimmung der, und ihnen verwandter Drogen.—Ber. d. Deut. Phar. Gesell, 1912, Vol. 22, p. 205,—R. Kobert,— Quillaja, p. 215; Senega, p. 218; Sarsaparilla, p. 227.
Testing the haemolytic effect on various kinds of blood, the author finds thirty year old quillaja bark practically unchanged. Thirty year old senega is only 1/5 the strength of fresh root, and Honduras and Vera Cruz sarsaparillas of the same age about 1/5 and 2/3 respectively.

Sirupus Ferri Iodati.,—P. Bohrisch,—Pharm. Zentralh., 1913, Vol 54, pp. 343, 371.
A general discussion as to preparation and preservation, with assays on 19 samples, fresh, at six months and twelve months.

Solanaceous Extracts, Keeping Properties of,—Ribaut,—Bull. d. Sci. Pharm., 1908, Vol. 15, p. 495; through Phar. Jr., 1908, Vol. 81, p. 588; also Proc. Am. Phar. Assn., Vol. 57, p. 74.
Loss observed after four years: Ext. Belladonna leaves, 3% to 45%; Ext. Hyoscyamus, 69%; Ext. Stramon. leaves, 8% and 31%; Ext. Belład. root, 1% to 12%; Ext. Hyoscyamus seed, 25%.

Spirit of Nitrous Ether, Inquiry into Causes of Change,—E. H. Farr and R. Wright,—Trans. Br. Phar. Conf., 1901, p. 447; through Proc. Am. Phar. Assn., Vol. 50, p. 749.
Deterioration is extremely rapid under ordinary conditions of storage.

Spirit of Nitrous Ether B. P., Progressive Deterioration in Containers,—S. F. Burford.—Chem. and Drug., 1908, p. 108; through Proc. Am. Phar. Assn., Vol. 50, p. 749.
Loss observed at intervals of 30 days during six months, when it had lost 82%.

Spirit of Nitrous Ether, The Keeping of, and a Suggestion for a Change in Formula,—Linwood A. Brown,—Am. Drug., 1911, Vol. 59, p. 215.
Gives results of assays made at intervals of two weeks on twelve different samples stored under varying conditions.

Spirit of Nitrous Ether, Deterioration of,—F. L. Shannon,—Jr. Am. Phar. Assn., 1910, Vol. II, p. 83.
Results are given on seven samples kept under average conditions and assayed at intervals of three months during fifteen months.

Spirit of Nitrous Ether, Preservation of,—G. E. Show,—Phar. Jr., 1903, Vol. 71, p. 236.
Properly stored, there is but slight loss. Under unfavorable conditions the loss in 14 days is from 12½% to 99%.

Standard Pharmaceuticals, Deterioration of Some,—H. E. Barnard,—Ph. Rev., 1908, Vol. 26, pp. 308, 321.
Experiments show an increase in strength with age in spirit of camphor and tincture of iodine and decrease in strength in lime water and ammonia water.

Strophanthus, Tr.,—Robert A. Hatcher,—Jr. Am. Med. Assn., 1907, Vol. 48, p. 1177.
No deterioration found in tincture even after sixteen years. The seeds do not undergo deterioration in keeping for several years.

Strophanthus, Tincture of,—A. R. Cushny,—Br. Med. Jr., 1912, Vol. II, p. 685.
Tinctures of digitalis, squill and particularly strophanthus, deteriorate rapidly after dilution with water.

Sydenham's Laudanum, The Preparation and Preservation of,—M. Debourdeaux,—Jr. Pharm. Chim., Series 7, Vol. 6, p. 544; through Chem. Absts., 1913, Vol. 7, p. 2093.
After storing, showed a loss of 6% of its morphine which was not found in the precipitate. After one year there was an additional loss of 10%. A 3½ year old tincture had lost 17%, and one 20 years old, 44%.

Tinctures, Do they Deteriorate with Age?—Drug. Cir., 1913, Vol. 57, p. 389; reprinted from the Chem. Drug.
A discussion of various preparations as to stability.

Tincture Iodine,—H. Wastenson,—Svensk. Farm. Tidskrift., Vol. 17, pp. 68, 81, 113; through Chem. Abst., 1913, Vol. 7, p. 1952.
Increase of HI determined in a number of tinctures at intervals during eight weeks. KI retards deterioration.

Tincture of Iodine,—E. H. Gane,—Am. Drug., 1904, Vol. 44, p. 39.
Impurities in alcohol cause deterioration. With good alcohol the loss is about 1% of I in one year.

Tincture of Iodine,—C. H. LaWall,—Proc. Am. Phar. Assn., 1907, Vol. 55, p. 156.
The U. S. P. VIII tincture is a stable preparation under practically all conditions.

Tincture of Iodine,—L. F. Kebler,—Jr. Am. Phar. Assn., 1913, Vol. II, p. 514; also Jr. Ind. Eng. Chem., Vol. 5, p. 484.
Attention is called to the preservative effect of KI and the variation in samples examined. The limit of permissible variation is discussed.

Tincture of Iodine, Alteration on Standing,—C. Courtot,—Jr. Pharm. Chim., Series 7, Vol. 1, pp. 297, 354; through Chem. Absts., 1911, Vol. 5, p. 564.
Three experimental tinctures were examined monthly for one year. The iodine decreased from 67.5 gm. per liter to 54.6, 54.6 and 58.4 gms. respectively.

Tincture of Iodine, Changes in, on Storage, etc.,—Th. Budde,—Apoth. Ztg., Vol. 27, p. 203; through Chem. Absts., 1912, Vol. 6, p. 1493; also Pharm. Ztg., 1912, Vol. 57, p. 176; through Jr. Am. Phar. Assn., Vol. 1, p. 881.
Loss amounts to 20% in 9 months retarded by addition of KI or NaI, but noticeable nevertheless after six months.

Tincture of Iodine, D. A. B.—V. Weiblitz,—Phar. Ztg., Vol. 57, p. 734; through Chem. Absts., 1913, Vol. 7, p. 535.
Free iodine content with age increases materially. Limits of variation are needed.

Tincture of Iodine, Influence of Light and Air.—C. Hugenholtz,—Phar. Ztg., 1907, Vol. 52, p. 222; through Proc. Am. Phar. Assn., Vol. 55, p. 697.
Deterioration is greater if kept in full bottles protected from light.

Tincture of Iodine—Influence of Temperature and Light, etc.—C. Courtot,—Jr. Pharm. Chim., Series 7, Vol. 2, p. 344; through Chem. Absts, 1911, Vol. 5, p. 2525.
Changes shown in tinctures of the French Codex 1908. Light has no influence, but temperature affects change.

Tinctures of Iodine, Observations on Commercial,—Agnes Dunning and L. E. Sayre,—Am. Drug., 1909, Vol. 55, p. 211.
An investigation of the effect on different kinds of stoppers. With cork stoppers there is progressive concentration.

Tincture of Iodine Therapeutically Considered,—C. Courtot,—Jr. Pharm. Chim., Series 7, Vol. 1, p. 439; through Chem. Absts., 1911, Vol. 5, p. 1492.
There is concentration with age by evaporation.

Tincture of Iodine, The Stability of Free Iodine in,—Droste,—Pharm. Ztg., Vol. 57, p. 166; through Chem. Absts., 1913, Vol. 7, p. 215.
The alkalinity of glass container responsible for loss.

Tincture of Iodine, U. S. P. VIII,—Theo. D. Wetterstroem,—Proc. Ohio State Pharm. Assoc., 1908, p. 52; through Proc. Am. Phar. Assn., Vol. 57, p. 115.
KI retards change. Strength increases by evaporation.

Tinkturen, Ueber die Zweckmässigkeit von Perkolation oder Maceration zur Herstellung von, —J. Herzog,—Ber. d. Deutsch. Phar. Ges., 1906, Vol. 16, p. 359.
Discusses the influence of air, light and temperature on tinctures.

Tinctures and "Alcoolatures," A Comparative Study of the Active Principles in Some,—E. Dejean,—Jr. Pharm. Chim., Series 6, Vol. 29, p. 274; through Chem. Absts, 1909, Vol. 3, p. 1909.
Attention is called to loss of alkaloid in drugs during drying and the resulting lack of activity in tinctures made from them as compared with "mother tinctures" from green plants.

Wild Cherry Bark, Valuation of,—A. B. Stevens,—Proc. Am. Phar. Assn., 1896, Vol. 44, p. 215.
Differences in assay point to deterioration.

Wild Cherry Bark,—A. B. Stevens,—Proc. Am. Pharm. Assn., Vol. 47, p. 184.
Deterioration shown by assays at intervals of one year.

Wild Cherry, Deterioration of Syrup of,—J. Graham French,—Proc. Penna. Pharm. Assn., 1912; through Am. Jr. Pharm., 1913, Vol. 85, p. 82.
Hydrocyanic acid disappears within 3 or 4 months.

THE PHARMACIST WHO THINKS.

The pharmacist who stands around and *thinks* is a better business man than the one who spends every working hour in detail work. The profitable business is made by successfully utilizing the labor of others. A man's powers for personal effort are limited; he must depend upon others to help him. His task is to derive a profit from the labor of those he employs. To do this he must have leisure to plan, to watch, to oversee and direct. He must not occupy his mind so that he cannot do this. The minute that a business man permits the details of his business to master him, he loses the mastery of his business. He ceases to progress. Instead of being the driver of the engine, he becomes only a wheel in the machine. He loses the power to guide and bends his efforts simply to keep it moving.—*The Spatula.*