

## Contributed and Selected

### COLORIMETRIC METHODS.\*

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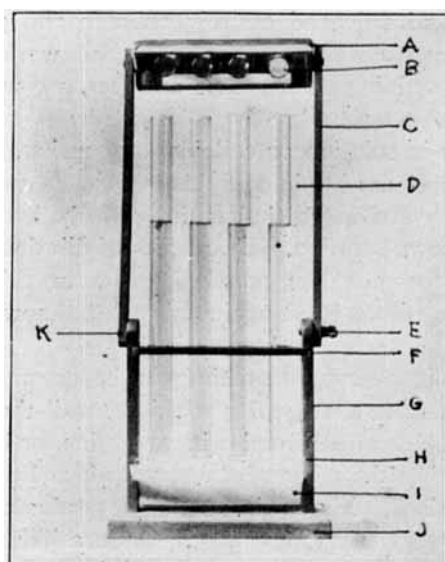
In bringing this subject before you at this time, I do so with one object in view and that is, to give the work the prominence it deserves, and mention the study it will require before it will reach a point of perfection, necessary to make it of general usefulness to our laboratory workers, especially our pharmaceutical chemists. No attempt will be made to explain in detail the various methods that have been found to possess reliable means of a determinative nature, but briefly to call your attention to a few, and incidentally mention their virtues over older methods, with such references as will give leading information should anyone desire to consult more fully the methods in question. The actual work that has been performed involving the principle of color measuring is meager, considering what has been accomplished in the interest of other methods of an analytical nature. That the principle here involved is not a new one needs no comment, but like most all things of simplicity, it is too common-place to be considered of much value. In contradiction to this mis-conception however, we will find in the question of a water analysis, an argument strongly in favor of a more careful study of this line of technic, for as a matter of fact, a water examination to be of any value will depend, for its completion, upon the principles concerned in colorimetric determinations, for if this were not true, or impossible, water examinations as a possibility would a long time ago cease to be a factor in matters pertaining to the chemist.

In viewing the literature on this subject, from a most varied and scattered field, I find mentioned here and there certain methods which when slightly modified from the original, reach closely a mark nigh onto perfection, for the purposes they have been offered. I find in particular, no limit to the uses to which color measuring has been applied in pharmaceutical practice, and there seems to be no limit to its applicability in general chemical analyses as well. As an innovation to our busy pharmacists and chemists, a set of reliable standard colorimetric methods would fill a well deserved place in the analytical laboratory, by reason of their use in preference to the more tedious, elaborate and time consuming methods of volumetric, gravimetric and electrolytic operations. A selected set of standard methods would be of the greatest value, if so arranged as to be easy of application without the sacrifice of accuracy. In reviewing the work thus far done, I did not locate any book in English, exclusively devoted to this subject, but I did encounter some few references to a German work, and some as to a French book, but this was all. The only treatise I know of as being of American

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origin and dealing principally with this line of analytical procedure, is bulletin No. 31 issued from the Bureau of Soils, of the Department of Agriculture. This was published in 1906. The methods mentioned in this work, are intended solely for soil work or analysis, but I have succeeded in using the same methods with slight modifications, in many other directions, and they have given very reliable results.

What a revelation would greet pharmacists, if much of this delicate weighing could be done away with by measuring depth of color in its stead, and thus determine the quantity of substances present. I venture to state, that the time is not far hence when much of this will be disposed of especially in our pharmaceutical laboratories, by virtue of the establishment of a number of reliable colorimetric methods. Not that all things will be possible by this means, but many things now



A—Movable mirror. B—Reflection of colors in tubes. C—Upper frame work-movable. D—Fifty cc. Nessler tubes. E—Thumb screw for adjusting upper movable frame work. F—Tube support with holes. G—Upright supports (rigid). H—Glass shelf tube rest. I—White opaque glass light reflector. J—Base for stand. K—Screw hinge.

analysable by no other way than by older methods, may yet be determined by color, either preformed or created.

Color analysis is more simple and in many instances more reliable than either weighing or measuring direct. There are times; and many things do exist, whereby no other method is applicable other than that of color comparison.

In order that we may better realize the scope of this line of analytical procedure, I am going to briefly mention a few methods selected at random that have peculiar virtues all their own for determining substances, colorimetrically, and some others not so readily estimated by other means than this, with results

exceedingly accurate, considering care in technic To go into greater length in describing these methods, would be unwise at this time since the discussion of one method alone would be sufficient material to form the basis of a paper in itself.

My sole intentions at this time are to bring the subject matter to you in such a manner, that you will become acquainted with the importance of its study, and thereby better realize the neglect it apparently has suffered.

I also desire to present to your notice a simple piece of apparatus, which I call for want of a better name "A Colorimeter." This instrument can be readily constructed, and such as it is serves every requirement, for it is inexpensive and less complicated than the more costly ones. [See p. 1461.]

In my laboratory it has left nothing to be desired, simple as it may appear, and setting aside faulty technic, it will by no means interfere with any attempt at accuracy, for there is nothing to get out of order, as to mislead vision.

A word as to technic. We must realize in this work as well as in all analytic operations, accurate results depend entirely on care and precision, hence each little mis-step multiplies itself to the end, for in this work we are dealing with minute quantities. In defining colorimetric analyses, we would consider it as a quantitative procedure, by estimating the color depths of two solutions, containing colored compounds in solution or colloidal suspension, which is usually performed by comparing columns of tinted fluids in suitable apparatuses. The comparison being made after striking a similar tint with the known or standard solution to that of the unknown solution. By a series of dilutions with water or other fluids indicated, the colors are then matched and from this the amount of substance (according to its color) is ascertained in the unknown solution and finally the sample itself.

The manner by which the color matching can be accomplished is by diluting with appropriate diluents, standard color solutions until the color so made compares exactly with the color of fluid under investigation, or by diluting the sample color itself until it reaches the color of the standard, or by varying the depth of the volume of the standard solution in a suitable graduated tube until it agrees with the color of the material under testing. Or in a like manner both volumes can be so adjusted, as to compare by the addition or removal of measured amounts until the colors agree when a simple calculation gives the data sought. In either case the work is simple.

In order that we may better comprehend the wide range of usefulness this principle can be applied to, the following will give a few representative examples covering as you will observe almost every domain of analytical manipulation. A few are as follows:

The determination of citral in lemon oil and lemon extracts by the use of meta-phenylene-diamin hydrochloride.

The estimation of the amount of albumose in anthrax cultures by precipitating the same with absolute alcohol.

The valuation of vanilla extracts, by determining the amount of vanillin, by using iron sulphate.

The estimation of salicylic acid in food products by the use of ammonio-ferric-alum.

The well known method of determining the amount of carbon in Bessemer steel, using Bessemer steel standards in acid solution.

The valuation of cudbear and caramel in solution are procedures well known to pharmacists.

The estimation of free lactic acid in stomach contents by using ferric chloride in hydrochloric acid to form the lactate of iron.

The estimation of hemoglobin in blood by the Gower method as modified by Sahli, using as a standard picrate of carmin in glycerine.

The determination of adrenalin in supra-renal glands, by using as a comparative standard, pyrocatechin and ferric chloride.

The sanitary examination of contaminated water supplies for the presence of lead, using a saturated solution of hydrogen sulphide.

The determination of very small amounts of strychnin in human viscera, for medico-legal purposes, using as a reagent to produce a characteristic color; sulphuric acid and sodium iodate.

The very reliable method of the Bureau of Standards for the precise determination of iron in solution by using sulphocyanic acid.

The well established method of Schreiner and Brown for the exact estimation of phosphates in soil by using magnesium mixture and ammonium molybdate.

In conclusion, I may state, that I have but only scratched the surface of the vast possibilities that remain open for research in this old, but disregarded field of analytic work. I make no claim for superiority over those of the older and well defined methods extant to-day, but I do feel, that there will be occasions when the older methods will be inadmissable, and therefore in such an event, we should have recourse to other means for an accurate determination of the substance under investigation. In view of that, a number of methods known to be of value by reason of their more general use, would be acceptable. In that direction colorimetric determinations would then fill a very important part in our daily routine.

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#### A STUDY OF THE WORK DONE BY THE COMMITTEE ON PHARMACY AND QUERIES OF THE VARIOUS STATE PHARMACEUTICAL ASSOCIATIONS.\*

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In the beginning of this study I was amazed, on investigating, to find a condition of apathy, much beyond my expectation. I was quite aware that conditions were not as they should be, for the conspicuous laxity or otherwise dis-interest in the welfare of this most important committee, as was manifested to me through the different channels I pursued, proved to be more serious in the end, than what I had any reason to anticipate at the beginning.

In this study as taken from various sources, three salient factors presented themselves to me as being the cause for this much neglected department of our state pharmaceutical associations.

First. The evident disregard by the majority of the members for this part of the annual proceedings.

Second. A seeming dis-interest towards the work or results of this particular committee.

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