from the pharmacopœial assay was physiologically active when dissolved in water in the proportion of 1 part aconite to 1400 of solution, while the residue from the ether-ammonia assay was not active in solutions greater than 1 to 1200.

Prof. Charles E. Caspari referred to a recent paper on Pepsin Assay, and stated that two different investigators had apparently proved that pepsin exerted its greatest action on egg albumen when the egg was about eight days old, after which the activity decreased until about the twentieth or twenty-first day.

Prof. Virgil Coblents referred to the employment of dried albumin in testing pepsin, and said that physiologists had generally adopted dried blood fibrin for this purpose. It possesses the advantage of uniformity, can be reduced to powder of any degree of fineness, and dried to any degree desired. After testing with pepsin the undigested excess can be removed, washed and dried, thus placing the testing of pepsin on a more nearly quantitative basis.

STANDARIZATION OF SOLUTIONS FOR ALKALOIDAL ASSAY.

A. B. STEVENS AND A. F. SCHLIHCTING.

It occurred to one of us that some of the variations in results obtained by chemists when assaying the same sample of drug, might be due to different standards used in preparing their standard solutions, possibly also to the indicator used. This suggested that it might be interesting and instructive to determine to what extent these factors affect the results, when conducting experiments under exactly the same conditions as to temperature, apparatus, etc.

A quantity of solution of potassium hydroxide was prepared, as nearly N/50 as convenient. The exact factor was then determined by means of the various standards used by chemists in drug assay. In testing these standards phenolphthalein was used as an indicator. The results are given in factors for the potassium hydroxide.

Standard	Potassium Bitartrate	Oxalic Acid	Succinic Acid	Sulphuric Acid	Hydrochloric Acid
KOH Factors	1.0561	1.0648	1.0638	1.0035	1.124
	1.0613	1.0627	1.0683	1.0057	1.112
	1.0629	1.0625	1.0706	1.0083	1.113
	1.0584	1.0611	1.0661	1.0972	
	1.0571	1.0618	1.0661	1.1006	
Average	1.0592	1.0625	1.0669	1.0962	1.118

Bear in mind that these results simply show the relation of one standard to another, or the variation between standards used.

Oxalic acid is preferred by some but has fallen into disrepute because it contains water of crystallization, a portion of which might be lost during drying, to free it from adhering moisture. Succinic acid is free from water of crystallization, hence can be dried without loss. The principal objection that can be raised to any of these for alkaloidal assays, is the fact that one indicator must be used in the standarization of the alkali, and another in the actual assay. It is proposed to overcome this objection by the use of pure anhydrous morphine as a standard. Morphine does not readily give up its water of crystallization. It requires a tem-

perature of about 110 degrees C. for several hours, and this darkens the morphine. It is also possible that some of the morphine has been decomposed. We prefer to use crystallized morphine, freed from adhering moisture by placing the powdered morphine in a desiccator for a few hours. A sample of crystallized morphine kept in a vacuum desiccator for twenty-four hours failed to lose weight, while a sample of oxalic acid kept in the desiccator for the same length of time lost nearly all of its water of crystalization.

A given weight of dried crystalline morphine was dissolved in a definite volume of standard sulphuric acid, and the acid actually combined with the morphine determined. From these results the acid factor was calculated. The average from several determinations was 1.0035 with cochineal, and 1.004 with methyl red. Compare these results with those for sulphuric acid under indicators. While we prefer morphine as a standard for alkaloidal assay, we feel that it has not sufficient advantage over potassium bitartrate to warrant a change from our present official standard.

INDICATORS.

Experiments were made to determine the variation in the results due to the use of different indicators. In the first series of experiments the potassium hydroxide solution was standardized by potassium bitartrate. In the second series by oxalic acid, and in the third series by succinic acid.

SULPHURIC ACID FACTORS.

	Phenolphthalein	Hæmatoxylon	Cochineal	Methyl Red	Iodoeosin
		FIRST SERIES.			
	1.0014	0.9904	0.9808	0.9793	0.9798
	1.0064	0.9906	0.9798	0.9800	0.9766
	0.9999	0.9925	0.9802	0.9793	0.9766
Average	1.0025	0.9912	0.9803	0.9795	0.9777
		SECOND SERIES			
	1.0045	0.9934	0.9839	0.9824	0.9826
	1.0096	0.9941	0.9826	0.9829	0.9796
	1.0039	0.9955	0.9832	0.9824	0.9796
Average	1.0057	0.9943	0.9832	0.9826	0.9806
		THIRD SERIES.			
	1.0079	0.9968	0.9872	0.9857	0.9861
	1.0130	0.9974	0.9861	0.9862	0.9828
	1.0064	0.9989	0.9863	0.9857	0.9828
Average	1.0091	0.9977	0.9865	0.9859	0.9839
Sulphuric acid factor obtained by use of morphine.					
		1.0164	1.0015	1.0015	
		1.0190	1.0029	1.0015	
	Average	1.0177	1.0022	1.0015	

After a careful study of these results we recommend the use of crystalline morphine as the standard for alkaloidal assay because it may be readily obtained pure,, of definite composition, and also because the same indicator may be used throughout. Next to morphine we prefer succinic acid because it is free from water of crystallization, dissolves readily and is easily titrated. Potassium bitartrate is preferable to sulphuric acid or hydrochloic acid, because it is more easily

prepared, is always ready for use, and is equally, if not more acurate. In any case a definite standard should be stated and adhered to.

When possible, the same indicator should be used throughout. If this cannot be done then use the same indicator for standardizing the acid that is to be used in determining the excess of acid.

ALIQUOT PARTS.

The statement has been frequently made that the use of aliquot parts, in the hands of experts, gives results which compare favorably with those obtained by the complete extraction method, but that this would not be true in the hands of less experienced chemists. The writer has never seen or heard of an attempt to prove this statement. He therefore selected six students, none of whom had more than a short course in drug assay work. One of them had not made more than a half dozen drug assays and had not even received instructions in assay work. They were given directions for the assay of scopola and cinchona by both methods and without further instructions than that they were to make duplicate assays as carefully as possible. They were not told the object of the assays. The results obtained are as follows:

	SCOPOLA.		CINCHONA	
	Aliquot Method	Percolation Method	Aliquot Method	Percolation Method
	0.31	0.35	5.57	5.88
	0.31	0.35	5.725	5.93
	0.263	0.27	5.242	5.73
	0.258	0.285	5.068	5.328
	0.263	0.289	6.02	7.03
	0.283	0.299	5.785	6.013
	0.336	0.304	4.955	5.236
	0.336	0.305	5.03	5.464
	0.29	0.230	5.555	5.692
	0.278	0.263	5.576	
	0.310	0.294		
	0.272	0.284		
Maximum ...	0.336	0.350	6.02	7.03
Minimum ...	0.263	0.238	4.955	5.236
Difference ..	0.073	0.112	1.065	1.794

DISCUSSION.

PROF. STEVENS: "The last page contains some figures which show the variation in results obtained by inexperienced workers when using aliquot parts and the complete extraction method. In addition I will place upon the board some results taken from Dr. Kebler's report on "The Status of Drug Assaying." A. Ph. A. Proceedings, Vol. 58. On page 858 we find the per cent. of variation in results obtained by different workers when using both methods, as follows:

Aconite Root.	Total extraction.....	20%	Aliquot parts....	25%
Belladonna Leaves.	" "	20%	" "	10%
" Root.	" "	15%	" "	5%
On pages 869, 871, we find:				
Aconite Leaves.	Total extraction.....	51.7%	Aliquot parts....	14.8%
" Root.	" "	38.1%	" "	48.3%
Belladonna Leaves.	" "	38.6%	" "	16.4%
" Root.	" "	28.0%	" "	9.8%
Cinchona Yellow. (Total alkaloids)	" "	21.6%	" "	11.1%
" Red.	" "	14.5%	" "	11.3%
Coca.	" "	46.5%	" "	54.4%

"These results from Dr. Kebler's report are especially interesting when compared with those presented in the paper, as the former may be said to represent the work of trained chemists, while the latter represents the work of inexperienced chemists. With both classes of operators we find that in the majority of cases the variation in results are less when aliquot parts are used. However, with equal care, I believe that the difference rbetween the two methods is not very great, so that if either method is used in the next revision of the Pharmacopœia there will be but little ground for criticism.

"The causes for error when using aliquot parts are: First, inaccuracy in measuring, and second, loss by evaporation when pouring the volatile solvent on the drug and again when measuring the aliquot part. To reduce this to a minimum the solvent should be cooled before measuring, and again reduced to the same temperature before measuring the aliquot part. It appears, however, that the error due to these causes is no greater than the error due to imperfect extraction, when using the total extraction method. Different results are frequently obtained by different operators when using the potassium mercuric iodide test to ascertain if the drug is exhausted."

THE PLACE OF THE JOBBER.

Of course, in the last analysis, the existence of the jobber depends, as it does with all others, upon his proving himself worthy of his hire. In business no men or methods can survive in a struggle with other men and other methods that do the work more cheaply and efficiently.

As long as a territory is sparsely settled its business does not justify manufacturers in sending out their own salesmen. The trade is handled by wholesalers. As soon as the territory becomes populous and prosperous, the manufacturer naturally begins to consider whether or not it is more to his advantage to deal direct with the retailer or through the medium of a jobber. This sort of situation is continually recurring, and the manufacturer's decision is made in terms of *cheapness* and *efficiency* of *service,* whether he advertises or not. In a situation like this, if the wholesaler cannot prove himself worthy of his hire, he loses his customers.

The manufacturer who wants to do away with the wholesaler has a man's job in front of him. Suppose, for example, he decides to do away with jobbers in the Middle West. The first thing he can count on is a loss of anywhere from 10 to 50 per cent of the trade—no very alluring prospect. Next, he must take upon himself the expense of a big selling force, of a vastly complicated shipping problem, of new storage warehouse facilities, of much increased bookkeeping and credit departments, and he must accept in the place of three or four large ledger accounts, which are as good as gold, several thousand petty accounts in which the risk of loss is problematical. Furthermore, he must induce the retailers to accept all the troublesome complications which come from buying from many concerns instead of from one.—*McPike's Bi-Monthly.*