Discussion and Conclusion

The solubility of hydrogen, oxygen, air, nitrogen, and carbon dioxide is slightly greater in butter oil than in cottonseed oil and lard at 40° C. The solubility of all the gases except hydrogen decreases when the temperature of the oil is increased from 40° C. to 60° C. Hydrogen in butter oil follows the behavior of the rare gases, as described by Lannung (3), who showed that the solubility of the rare gases and hydrogen when dissolved in organic solvents increased with increase in temperature. The results obtained in the present experiments are slightly higher in value than those obtained by Vibrans (2), except in the case of the solubility of carbon dioxide in cottonseed oil in which case they were slightly lower in value. The values obtained for the solubility of carbon dioxide in lard in the two cases were approximately the same. Vibrans conducted his experiments at 45° C. rather than at 40° C. as in the present experiment. The only result of the present investigation which is comparable to those of Schmidt-Nielsen (1) is the solubility of air in cottonseed oil. This author's results are slightly lower than those reported herein. However, the temperature used was 50° C., or 10° C. higher than that used by the present authors. In experiments conducted in these laboratories on the removal of gases from fats, it was found that vigorous shaking in a high vacuum at a temperature close to 100° is necessary for complete removal of all dissolved gases. It is believed that our results were higher than those of others because of a more complete removal of dissolved gases from the fats, before solubility measurements were made.

BIBLIOGRAPHY

(1) Schmidt-Nielsen, S. Academia Scientianum Fennica Annales. a-29 (1927).
(2) Vibrans, F. C. Oil and Soap, *12*, 14-15 (1935).
(3) Lannung, A. Jour. Am. Chem. Soc., *52*, 68 (1930).

Report of the Color Committee 1942-1943

Due to the fact that all of the members of the committee have been unusually busy, no actual committee work has been done, but we have considered several problems related to progress in the evaluating of oils for color.

The most important item of unfinished business that has been before the committee is an improved colorimeter which can be adopted by the society for use in the official grading of vegetable oils. Although several instruments have been tentatively proposed in the past for this purpose, the only real progress that has been made in the last two years has resulted from work done by the Spencer Lens Company; first, through Dr. R. S. Estey, and during the current year, Dr. Morden G. Brown. An experimental model of an instrument was sent around to members of the committee during the 1941-42 season, and although it did not meet with general approval, it has served as a basis, for the consideration of the present committee, of the features that seem desirable in a colorimeter.

The committee, therefore, makes the following recommendations:

1. The manufacturer of a colorimeter, to be submitted for adoption as a standard instrument for the American Oil Chemists' Society, should not be so limited as to the selling cost of the instrument as to prevent incorporating in it desirable and necessary optical and mechanical features; on the other hand, of course, the cost must not be so prohibitively high as to prevent its universal adoption. An oil colorimeter is used for commercially evaluating oils, and small differences in color, which can easily result from the use of an inefficient instrument, cause wide variations in values established by color tests. We believe that no referee or plant laboratory would object to paying a fair price for a satisfactory instrument.

2. The majority of the committee is in favor of incorporating in the instrument a mechanical means of introducing the color glasses into the field of vision. It is thought that this will avoid breakage and scratching of the glasses and the soiling of their surfaces as is almost unavoidable when they are used manually. A minority of the committee feels that this mechanical feature might make the cost of the instrument unnecessarily high and that it should be optional. There is no objection to this except that the construction of two different models might make each of them cost more than would be the case if one model could be definitely agreed upon and adopted. One member suggests that the glasses and mechanism for changing them might accumulate a film of grease or dirt in a plant control laboratory and require frequent cleaning. This is probably a matter of design and construction of the instrument and should be considered by the manufacturer. It hardly seems probable that such a possibility would compare with the known difficulties of manual changing of glasses.

3. The committee believes that a mechanical means of introducing the color tubes into the field of vision is desirable but not necessary and that that can best be left to the discretion of the manufacturer, provided, of course, that if the color tubes are to be placed in the instrument singly the construction should be such that this can be easily done and without risk of soiling with dripping oil the optical parts of the instrument.

4. The committee believes that the optical details of the instrument, insofar as its development is concerned, should be left to Dr. Morden G. Brown and the Spencer Lens Company with the collaboration of Mrs. Geraldine W. Haupt, of the Bureau of Standards.

5. The committee is not unanimous in regard to incorporating in the instrument a means for varying and controlling the brightness of the field. Some of the members believe that this would cause confusion and variations in color determinations even greater than those which now occur as a result of not being

able to control brightness. It must necessarily be remembered that color gradings of oil samples are not merely of scientific interest but that these color gradings are made for the purpose of commercial evaluation. Radical changes in the principles involved in color determinations might affect the basic trading rules of the National Cottonseed Products Association. Dr. Freyer has suggested that the brightness should be controlled and measured quantitatively; a feature which was not in the original experimental model. If it can be shown that such a feature is practical and would not cause confusion in commercial practice it might be desirable. More work is necessary along this line.

Dr. Brown, in a recent letter to the committee, reminded us that no instrument for matching colors could overcome inherent defects in the vision of the observer. Some years ago when Mr. Harry P. Trevithick was President of the Society he arranged for tests, by a representative of the Bureau of Standards, of members, particularly Referee Chemists, for color blindness. It is too late to undertake such a test at the coming meeting of the Society, but we recommend that the Governing Board give consideration to the advisability of providing such tests at the 1944 Spring meeting.

During the past few months the Special Subcommittee of the Finished Materials Standards Committee and Trading Rules Oil Committee of the National Soybean Processors Association, of which Mr. Lamar Kishlar is Chairman, has developed a new method for color grading of green soybean oils. Our committee has considered the desirability of work on this method, but, upon the advice of Mr. Kishlar, has decided not to take action at this time. We suggest that this be referred to the incoming committee for 1943-44 with the further suggestion that co-operative work with Mr. Kishlar's committee be carried on if he thinks it desirable.

The committee recommends that the following change be made in the A.O.C.S. Methods on page 16F, under "Refined Oils—Color"—subparagraph "Lovibond Color Glasses"—and after the paragraph which reads: "Laboratories analyzing corn and soybean oils shall have 50 and 70 yellow glasses in addition to the above," add the following paragraph:

> "The color glasses should be kept clean and free from oil film. They should be handled carefully and protected against acquiring scratches. It is especially important that every color glass used shall be clean at the time of its use."

G. WORTHEN AGEE, *Chairman* — DR. E. B. FREYER
MRS. GERALDINE W. HAUPT — N. C. HAMNER
R. E. BASS — E. O. SEABOLD
M. G. BOULWARE — R. C. STILLMAN
DR. MORDEN BROWN — HARRY P. TREVITHICK

Report of the A.O.C.S. Oil Characteristics Committee — 1942-1943

The following oils have been passed upon by this Committee: Palm and Palm Kernel, Coconut and Sunflower Seed Oils.

It is again urged that members of the Society and those engaged in the trade consider this list and note any exceptions to the specified data, calling attention to the chairman of such and any new matter.

A. O. C. S. RECOMMENDED STANDARD FOR PALM KERNEL OIL

(From the kernel or nut of the fruit Elaeis guineensis.)

Spec. Grav. @ 99/15.5°C.	0.860 to 0.873
nD @ 40°C.	1.449 to 1.452
Iodine Value	14 to 22
Sap. Value	245 to 255
Unsaponifiable	Maximum 0.8%
Melting Point	24 to 26
Setting Point	20 to 26

The setting point may be used in lieu of the titre and is a very convenient method of testing for hardness (solidifying point). It is performed on the filtered oil in the same manner as the titre, having a low point before rising as in the titre to a maximum recorded temperature.

A. O. C. S. RECOMMENDED STANDARD FOR SUNFLOWER SEED OIL

Spec. Gr @ 25/25°C.	0.915 to 0.919
nD @ 25°C.	1.472 to 1.474
Iodine Value	125-136
Saponification Value	188-194
Unsaponifiable	Max. 1.5%
Titre	16-20

A. O. C. S. RECOMMENDED STANDARD FOR COCONUT OIL

Spec. Gr. @ 99/15.5°C.	0.869-0.874
@ 25°C.	0.917-0.919
nD @ 40°C.	1.448-1.450
Iod. Value*	7.5-10.5
Sap. Value*	250-264
Unsaponifiable	Max. 0.5%
Titre	20 to 24
Setting Point	21.8 to 23
Reichert-Meissl No.	6-8
Polenske No.	15-18

A. O. C. S. RECOMMENDED STANDARD FOR PALM OIL

(African and Sumatran*)—from the outer pulp or fleshy part of the fruit of Elaeis guineensis.

Spec. Gr. @ 100°F. (37.8°C.)	0.898 to 0.901
nD @ 40°C.	1.453 to 1.456
Iodine Value	44 to 58
Saponification Value	195 to 205
Unsaponifiable	Max. 0.8%
Titre	40 to 47

Color of the crude oil—Orange yellow to dark red.

Classification: Hard and soft oils, according to acidity; the higher the acid content, the harder the oil.

---

* As sometimes happens, oils from parings or rind of the kernel is added to "whole" coconut oil; the iodine value is thereby considerably raised and is usually 11-14, the sap. value lowered and is usually 248-254.

* The South American oil palms are either a different variety (Elaeis melanococca) or African imported. In any case both pulp and kernel oils show distinct differences and are not included in the above analytical list.