Specifications of Fatty Acid Composition for Identification of Fats and Oils by Gas Liquid Chromatography

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The Codex Committee on Fats and Oils of the Joint Food and Agricultural Organization of the United Nations and the World Health Organization (FAO/WHO), Codex Alimentarius Commission, has for several years had under consideration a complete revision of their standards for the identification of fats and oils. As early as 1966, the Canadian Delegation proposed that the classical method be replaced by an alternate system based on the fatty acid composition of each fat or oil as determined from gas liquid chromatographic patterns. The classical method is based on the identification of a specific fat or oil by means of a combination of its iodine value, relative density, refractive index and saponification value.

Prior to the third meeting of the Fats and Oil Committee held in London April 24–28, 1967, the Canadian Delegation submitted a proposal for the replacement of the classical method with a gas liquid chromatographic (GLC) procedure. In this proposal the Canadian Delegation discussed disadvantages of the classical system, particularly the requirement for a heavy investment of analytical time and skill in many techniques, and inability, even when all four indices are considered, to resolve several admixtures containing common oils of commerce. At the same time, advantages of the gas liquid chromatographic procedure were emphasized, including the fact that it permits identification of oils which cannot be identified by the classical method and offers promise of resolving many additional pairs of oils in admixture. Furthermore, since it requires only one analysis, it can be made quite rapidly and applies equally well to refined and unrefined oils, necessitating only one set of standards.

From the beginning, at least as early as 1966, the United States supported the Canadian proposal in principle and recommended specifically that the Codex Committee on Fats and Oils urge the Codex Committee on Methods of Analysis to evaluate the current status of the science of gas liquid chromatography and, if feasible, to adopt GLC procedures that can be used by the Codex Committee on Fats and Oils.

At the fourth meeting of the Codex Committee on Fats and Oils, sponsored by the Joint FAO/WHO Codex Alimentarius Commission and held in London, April 24–28, 1967, the Canadian proposal was presented. The U.S. position on the proposal was one of partial support. This position was explained: "Full support of the Canadian proposal would not be justified, since most available evidence indicates that adoption of the proposal at this time would be premature and would lead to serious practical difficulties. Full opposition to the proposal would place the United States in a position of being ultra-conservative and unwilling to recognize the most modern scientific advances in the field of fat and oil analysis. The U.S. delegation therefore took the position that a system of identification based on GLC, in addition to the classical system, be carried in the draft standards at this stage. This would be done with the expectation that before final promulgation of the standards, the science of GLC will have progressed to a point where the present uncertainties concerning it would be eliminated and that it would provide a far more accurate means of identification than is possible with the present classical procedures. If this expectation should be realized, the classical system could then be dropped before final promulgation. The U.S. delegation argued that acceptance of its views would encourage the necessary international cooperation needed in the further perfection of the GLC system of oil and fat identification." After considerable discussion this U.S. position prevailed among the delegates from the 21 nations represented at this fourth meeting.

In comments on the Canadian proposal, submitted to delegates of the countries to be represented prior to the April 1967 Meeting, the United States delegation had presented its position, as given above. With their comments the delegation commented on the requirement for GLC standards and proposed to solicit recommendations concerning such standards from the Codex Committee on Methods of Analysis which would likely be based on the work of the International Union of Pure and Applied Chemistry. In these remarks they commented that the American Oil Chemists' Society, through its Instrumental Techniques Committee and the Gas Chromatography Subcommittee thereof, was currently very active in this field and "could probably render valuable assistance to the Codex Committee on Methods of Analysis" hopefully prior to the April 1967 meeting.

The hope for accomplishment of this objective prior to the April 1967 meeting was apparently not realized, but shortly after acceptance of its proposal at this meeting, the United States delegation, through its Chairman Lawrence Zeleny, contacted the Society with a request for assistance in the preparation of such standards. The AOCS Executive Director, C. H. Hauber, arranged a meeting which was held during the joint AACC-AOCS 59th Annual Con-

(Continued on page 195A)

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[1] So. Utiliz. Res. Dev. Div., USDA.
[2] E. Utiliz. Res. Dev. Div., USDA.

TABLE I

Arachis Oil[a,b]

Acids	Carbon atoms	Range
Saturated	Less than 14	<0.5
Myristic	14:0	<1.0
Palmitic	16:0	6.0–14
Stearic	18:0	2.0– 6.5
Arachidic	20:0	1.0– 2.0
Behenic	22:0	2.0– 4.0
Lignoceric	24:0	1.0– 2.0
Palmitoleic	16:1	<1.0
Oleic	18:1	40 –72
Linoleic	18:2	13 –38
Linolenic	18:3	<0.50
Eicosenoic	20:1	0.5– 1.5

[a] Synonyms: peanut, groundnut.
[b] Fatty acid composition by gas chromatography (wt % of methyl esters).

TABLE II

Cottonseed Oil[a,b]

Acids	Carbon atoms	Range
Saturated	Less than 14	<0.5
Myristic	14:0	0.5– 2.0
Palmitic	16:0	17 –29
Stearic	18:0	1.0– 4.0
Arachidic	20:0	<0.5
Behenic	22:0	....
Lignoceric	24:0	....
Palmitoleic	16:1	<1.5
Oleic	18:1	13 –44
Linoleic	18:2	33 –58
Linolenic	18:3	<0.5
Eicosenoic	20:1	<0.5

[a] Synonyms: none.
[b] Fatty acid composition by gas chromatography (wt % of methyl esters).

Fats and Oils Situation (Summary of Report)

Recent strong demand points to a 13% to 15% boost in total soybean usage this marketing year above 1968/69's level of 950 million bushels. In fact, the uncertainties in world supplies of competitive fish meal and oil and sunflowerseed oil could result in an even larger increase. In this event, soybean utilization could approximately balance the 1969 soybean crop. Relatively low commercial carryovers last fall here and abroad, and rising domestic requirements for oil and meal lend added demand strength. Thus, the U.S. soybean carryover next September 1 may only moderately exceed last September's 324 million bushels.

Soybean prices to farmers averaged $2.28 per bushel in September-December, 10¢ less than the year before. This decline reflected a record supply of soybeans and the lower support rate, along with a strong expansion in domestic and foreign demand. Continued strong demand and heavier earlier movement of soybeans under CCC loan suggest some price strengthening into spring. Market prices moved up this January but still remained below year-earlier levels.

In contrast to lower soybean prices so far this marketing year, soybean oil and meal prices have been up, resulting in the most favorable processing margins since 1965. The spot price spread between soybeans and the total value of oil and meal per bushel at Decatur averaged about 50¢ in September-December, compared with 19¢ in the same months the year before and 44¢ in 1965.

Favorable processing margins are stimulating a record crush and many processors have been operating at or near capacity. September-December crushings totaled nearly 235 million bushels, up about 34 million from a year earlier. Crushings for the entire marketing year may total 675 million bushels, or above, up from 606 million in 1968/69. The record output of oil and meal is moving into marketing channels, and crushers' and refiners' stocks remain low.

Soybeans inspected for export from last September 1 through January 16 totaled 174 million bushels, up 38 million. The gain over last year will widen sharply through mid-February. Atlantic and Gulf Coast longshoremen were on strike at this time in 1969. Europe and Japan are taking most of the increased shipments, reflecting growth in poultry and livestock production, reduced competition from other oils and meals, and a general strengthening in world fats and oils prices compared with a year earlier. Pending further foreign developments, soybean exports for the entire marketing year may total about 340 million bushels compared to the 1968/69 record of 287 million.

Cottonseed oil supplies in the current marketing year are nearly 1.8 billion pounds, up a tenth. The 1969 cottonseed crop fell 8%, but carryover stocks of oil (mainly in CCC hands) increased. Domestic use is running slightly above last year's near-record low of 1.0 billion pounds but exports are up sharply, due to increased commercial sales in addition to large CCC shipments. Cottonseed oil prices in August-December averaged 15% below a year earlier.

Nearly a tenth less lard output is expected for 1969/70, down from about 2.0 billion pounds in 1968/69. Farmers have reduced hog slaughter and the downtrend in lard yield per hog continues. Relatively high lard prices—the October-December 1969 average of 12¢ per pound at Chicago was 5¢ above 1968—are causing many domestic users of lard in shortening and margarine to shift to lower priced substitutes. USDA payments to exporters of U.S. lard to the United Kingdom will limit the expected small decline in exports from last season's total of 223 million pounds.

The Fats and Oils Situation is published by the Economic and Statistical Analysis Division, Economic Research Service, U.S. Department of Agriculture, Washington, D.C. 20250.

Chicago Will Host ISF World Congress and AOCS Fall Meeting

September 27 to October 1, 1970

All roads will lead to Chicago this Fall when the American Oil Chemists' Society plays host to the International Society for Fat Research at the Conrad Hilton Hotel. It will be the first time that the ISF has chosen the United States as the site for their Bi-Annual Congress and this year it will coincide with the 44th Annual Fall Meeting of the AOCS.

Diverse Technical Program

Four plenary sessions with outstanding speakers have been planned, one for each day of the technical program. There will also be a number of general sessions devoted to the chemistry of fatty acids and derivatives, fat and oil industrial problems, lipid biochemistry (including biosynthesis, metabolism, nutrition and clinical aspects), detergent testing and formulation and many others.

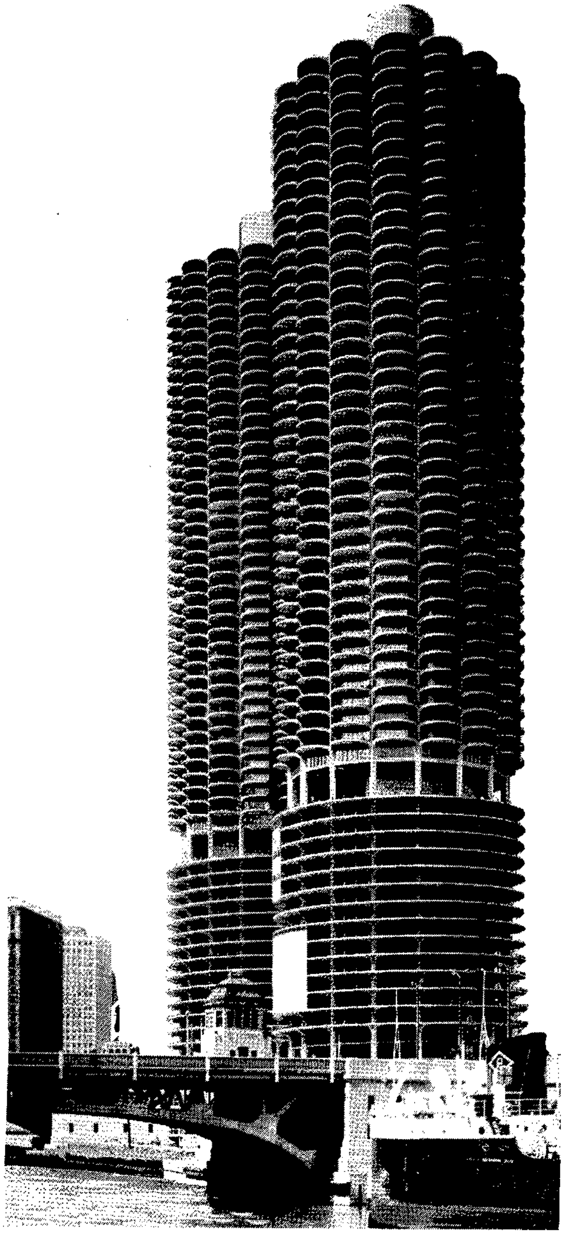
The following symposia have been organized by the chairmen indicated:

1. Metal-Catalyzed Lipid Oxidation—Jan Pokorny and Reinhard Marcuse.
2. Physical and Chemical Methods of Testing Oil and Oil-Based Products—L. H. Wiedermann.
3. Chemistry of Cruciferous Oil Seeds—L. A. Appelqvist.
4. Modern Oil Processing—A. M. Gavin.
5. Detergents—M. E. Ginn.
6. Application of Fats and Oils in Foods—V. K. Babayan.
7. Deep Fat Frying, Chemistry, Technology and Nutrition—S. S. Chang.
8. Flavors and Off-Flavors in Oil and Oil-Based Products—R. G. Krishnamurthy.
9. The Role of The Oilseed Processor in Food Protein Products for World Consumption—A. R. Baldwin and Max Milner.
10. Biochemistry of Hydrocarbon Degradation—R. W. Walker.
11. Chemistry and Biochemistry of Polyunsaturated Fatty Acids—R. T. Holman.
12. Long Term Nutritional Effects of Dietary Fats—Hans Kaunitz.
13. Chemistry and Biochemistry of Tocopherols—D. C. Herting.
14. Atherosclerosis and Lipid Metabolism—W. E. Connor.
15. Relationship of Lipids to Thrombosis and Blood Coagulation—W. E. Connor.

Two short courses are being offered by the AOCS in conjunction with the World Congress. The first will be given at Michigan State University, East Lansing, Mich., in the week before the Congress, September 20–25, under the co-chairmanship of LeRoy Dugan of Michigan State University and R. J. Hlavacek of Hunt-Wesson Foods. The subject will be, "Processing and Quality Control of Fats and Oils."

In the week following the Congress, October 4–7, a Short Course on "Behavior of Membrane Lipids at Surfaces," will be conducted at one of the Universities in New York City. Giuseppe Colacicco, York College of The City University of New York, is the chairman.

In addition, an International Conference on the Science and Technology and Marketing of Rapeseed and Rapeseed Products will be held at the LeChanteler Hotel, Ste-Adele, Quebec, September 20–23. The dates are convenient in relation to the dates of the World Congress. It is being organized by Bernd Weinberg of the Edible Oils Section, Department of Industry, Ottawa, Ontario.



Outstanding Exhibits Planned

Outstanding exhibit opportunities have been planned for the Chicago Meeting with Headquarters in the largest hotel in the world, located in the Convention Capital of the World.

With an all-time record attendance expected, exhibitors are assured of an overwhelming response to their displays.

In addition to the regular exhibit space, an area has been set aside for a number of mini-type, literature only, exhibit tables.

W. R. Deutscher, Exhibits Chairman, is planning several innovations which are expected to attract more exhibitors as well as making the exposition more productive for exhibitors. Exposure to an international market promises to add exciting additional momentum. Please contact S. M. Gaskins, Exhibits Sales Mgr., AOCS, 35 E. Wacker Dr., Chicago, Ill. 60601, or call (312) 782-2455, to reserve your booth space or for more information.

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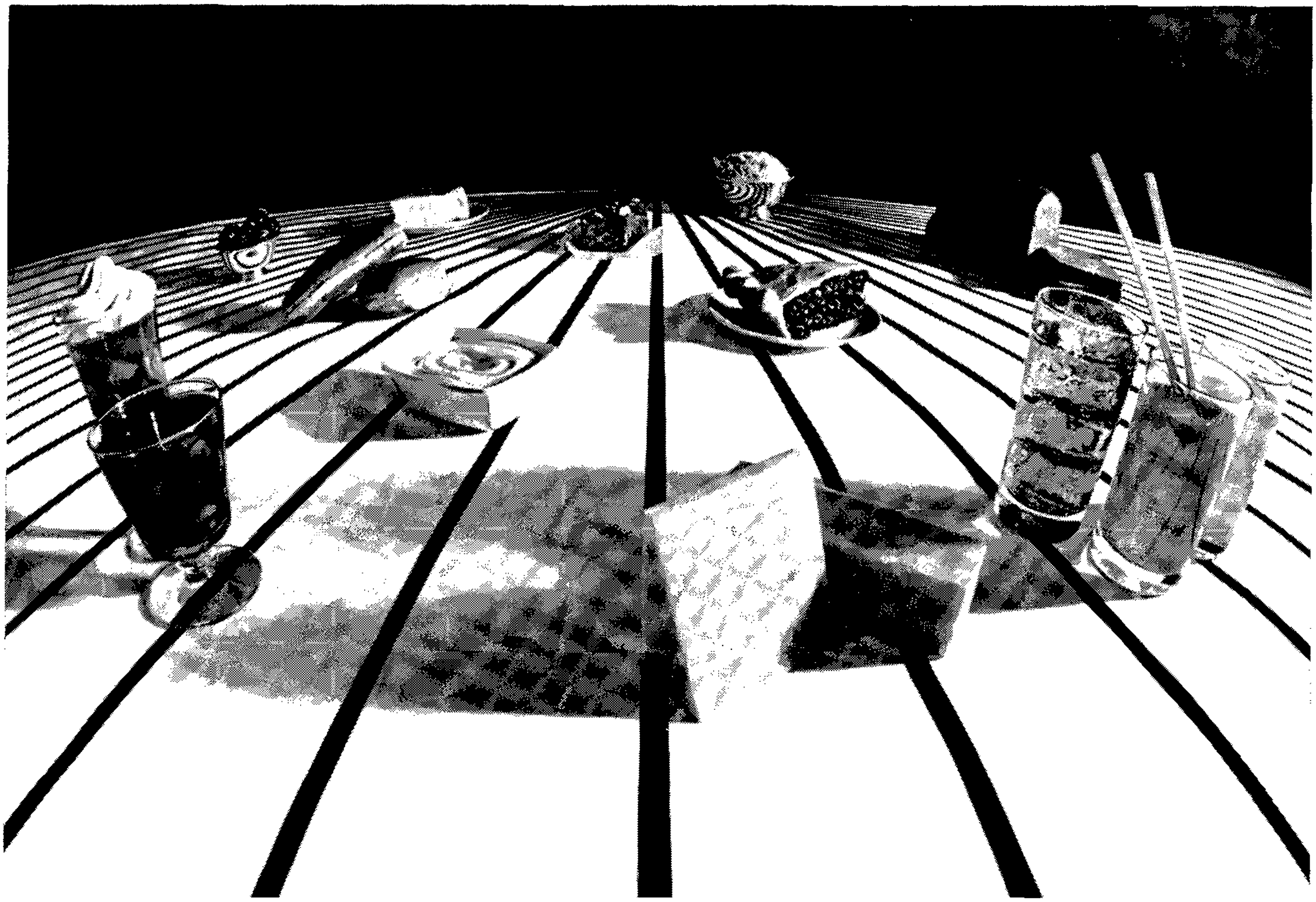

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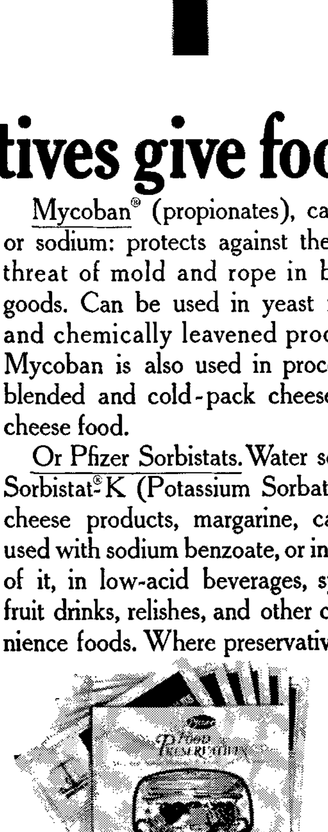

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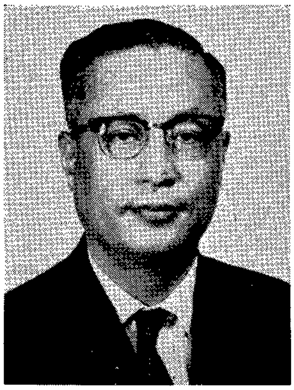
New AOCS Officers for 1970-71 Announced

Announcement and installation of new officers for the period of 1970 to 1971 were made at the 61st Annual Meeting held in New Orleans April 26–30, 1970.

Ballot counting was held at the AOCS National Headquarters in Chicago on April 3rd. Of the 1292 ballots received, 1265 were validated and counted. The results of the election are as follows.

President

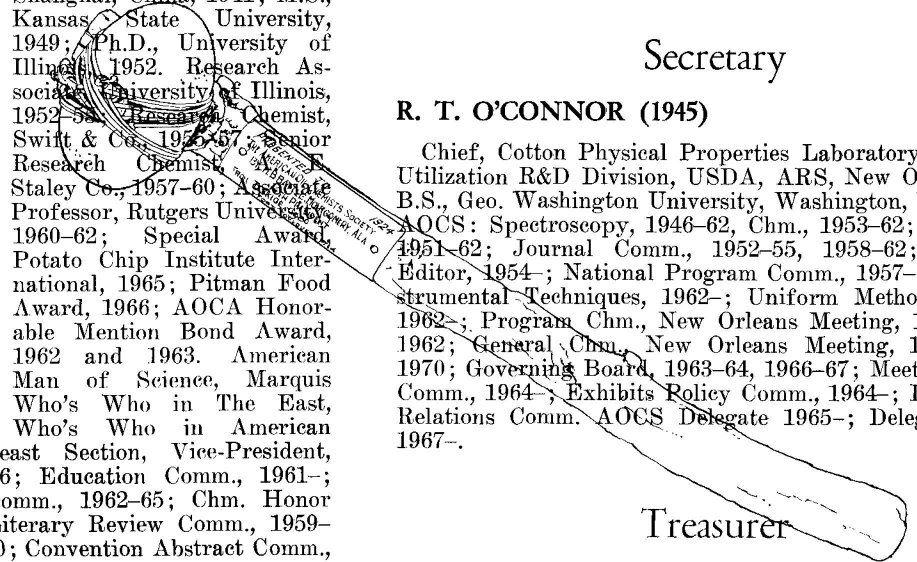
S. S. CHANG (1952)



S. S. Chang

S. S. Chang has been elected President for the 1970–1971 period. He is Professor at Rutgers, The State University, New Brunswick, N.J. B.S., National Chi-Nan University, Shanghai, China, 1941; M.S., Kansas State University, 1949; Ph.D., University of Illinois, 1952. Research Associate, University of Illinois, 1952–55; Research Chemist, Swift & Co., 1955–57; Senior Research Chemist, A. E. Staley Co., 1957–60; Associate Professor, Rutgers University, 1960–62; Special Award, Potato Chip Institute International, 1965; Pitman Food Award, 1966; AOCA Honorable Mention Bond Award, 1962 and 1963. American Man of Science, Marquis Who's Who in The East, Who's Who in American Education. AOCS: Northeast Section, Vice-President, 1964–65; President, 1965–66; Education Comm., 1961–; Chm. MacGee Award Subcomm., 1962–65; Chm. Honor Student Program, 1965–; Literary Review Comm., 1959–61; Abstract Comm., 1955–60; Convention Abstract Comm., 1955–60; Philadelphia Convention Program, 1966; Chm. New York Convention Program, 1968; Chm. Communication Comm., 1968–69; Chm. National Meetings Planning Comm., 1968–69; Governing Board, 1966–68; Secretary, 1968–69; Vice-President, 1969–70. Five patents and 52 publications.

G. C. Cavanagh, outgoing President, presented the ceremonial gavel to incoming President, S. S. Chang. The gavel, which is over 250 years old, is an authentic Indian Tomahawk. It was presented to the Society in New Orleans on May 6, 1924, by H. B. Battle, 14th President, as a symbol of the first American Oil Chemists, the Indians, who used similar tools to crush nuts from which oil was produced.



Vice-President

R. R. ALLEN (1950)

Director of Exploratory Research, W. L. Clayton Research Center, Anderson Clayton Foods, Richardson, Texas, since 1956. B.S., 1947; M.S. 1948; Ph.D. 1950, Kansas State University; Research Chemist, Armour and Co., 1950–56. Author of numerous papers and patents on autoxidation, hydrogenation, food emulsifiers, flavors and analysis of fats and oils. AOCS: Chicago Conv. 1951, 1953; Fatty Acid Award, 1957–1958; Spectroscopy Comm., 1958–; Education Comm., 1958–; National Program Planning Comm. 1960; Bond Award, 1961–63; Chm. Subcomm. on Short Course, 1966; Membership Comm., 1965–; Awards Comm., 1968–; Board Member at Large, 1968, 1969; Lecturer on various topics at AOCS Short Courses.

R. R. Allen

R. T. O'Connor

Secretary

R. T. O'CONNOR (1945)

Chief, Cotton Physical Properties Laboratory, Southern Utilization R&D Division, USDA, ARS, New Orleans, La. B.S., Geo. Washington University, Washington, D.C., 1937. AOCS: Spectroscopy, 1946–62, Chm., 1953–62; Oil Color, 1951–62; Journal Comm., 1952–55, 1958–62; Associate Editor, 1954–; National Program Comm., 1957–; Chm. Instrumental Techniques, 1962–; Uniform Methods Comm., 1962–; Program Chm., New Orleans Meeting, 1957, 1959, 1962; General Chm., New Orleans Meeting, 1964, 1967, 1970; Governing Board, 1963–64, 1966–67; Meetings-Study Comm., 1964–; Exhibits Policy Comm., 1964–; Intersociety Relations Comm. AOCS Delegate 1965–; Delegate Chm., 1967–.

Treasurer

F. A. NORRIS (1942)

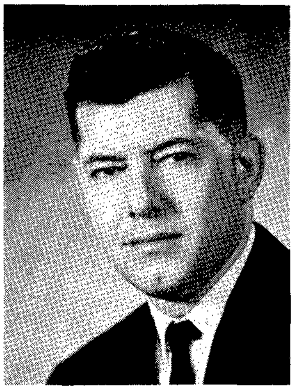
Director of Research Administration, Kraftco Corporation, R & D Division, Glenview, Ill. B.S., University of Pittsburgh, 1935; Ph.D., 1939; Post-Doctorate Fellow, University of Minnesota, 1939–41. Research Chemist, General Mills, Inc., 1941–44; Research Chemist, Swift & Company, Head Oil Mill Research, 1945–64, Refinery and Margarine, 1964–66. AOCS: North Central Section: Board Member, 1961; Program Chm., 1965–66; Secretary, 1966–67; Vice-President, 1967–68; President, 1968–69. Program Chairman AOCS Fall Meeting, 1967. Member Ways & Means Comm., 1967–68, Chm., 1968–; Chm. Scopes Comm. 1969–70; Ad Hoc Comm. Chm. 1969–70. Member Nominating Comm. 1967–68, AOCS-AACC Joint Steering Comm. 1967–68, Program Comm. for 1970 AOCS-ISF Joint Meeting. Board Member at Large 1969–70.

Board Member-at-Large

J. G. ENDRES (1961)

Assistant Director of Food Research, Armour and Company, Oak Brook, Illinois. B.S., Chemical Engineering, University of Illinois, 1955; Ph.D., Food Science, University of Illinois, 1961. Author of numerous papers and patents on thermal oxidation, fat technology and bakery technology. AOCS: Abstract Comm. 1964–; Ways and Means Comm. 1967–; Nominating Comm. 1965–1967; North Central Section: Board Member 1966–68; Treasurer 1968–69; Secretary 1969–70; AOCS Co-Program Chm. Chicago Fall Meeting 1970.


F. A. Norris


J. G. Endres


F. W. Quackenbush


K. T. Zilch

F. W. QUACKENBUSH (1943)

Professor of Biochemistry, Purdue University, Lafayette, Indiana. University of Wisconsin, B.S. 1932, Ph.D. 1937; Rockefeller Foundation Fellow, Kaiser-Wilhelm Institute for Medical Research, Heidelberg, 1938; Rijk's University, Utrecht, 1939; Research Fellow, University of Wisconsin, 1940–42; Professor, Purdue University, 1943–; Head, Dept. of Biochemistry, Purdue University and Indiana State Chemist, 1943–65; Pres., Assn. of Official Analytical Chemists, 1963; received Harvey W. Wiley Award, analytical chemistry, 1965; AOCS: Commercial Fats and Oils Comm., Chm. Subcom. on Feed Grade Fats, 1961–; Education Comm. 1960–; Host, Short Course at Purdue, 1956.

K. T. ZILCH (1955)

Technical Director, Fatty Acid Division, Emery Industries, Cincinnati, Ohio. Supervised Quality Control, Analytical Research, Process Research, Applications Research, Fundamental Research. Research Chemist, Group Leader, 1955–59; Manager, Fatty Acid Research Section, 1959–61. Ph.D., Organic Chemistry, University of Missouri, 1949; Officer in Armed Forces, 1943–46, Pilot. Research Chemist, USDA, Peoria, Ill., 1949–55; Instructor, Bradley University, Peoria, Ill., 1950–52. AOCS: Co-Chm., Cincinnati AOCS Convention 1965; Advertising Comm., 1967–; Chm., National Program Planning Comm., 1969; Co-Chm., Fatty Acid Short Course, 1969.

Other Board Members (the four most recent past presidents of the AOCS) are: C. W. Hoerr ('43), Glidden-Durkee Division of SCM Corporation, Strongville, Ohio; R. R. Reiser ('46), Distinguished Professor, Department of Biochemistry & Biophysics, Texas A & M University, College Station, Texas; J. C. Cowan ('41), Chief, Oilseed Laboratory, Northern Regional Research Laboratory, Peoria, Illinois; and G. C. Cavanagh ('46), Ranchers Cotton Oil Company, Fresno, California.

ANNOUNCEMENT

1970-71

SMALLEY CHECK SAMPLE PROGRAM

The Smalley Committee annually offers a number of Check Sample Series in various analytical categories. Interested analysts should write to Smalley Committee, AOCS, 35 E. Wacker Drive, Chicago, Illinois 60601, prior to July 15, 1970 for order forms and complete information, which will be distributed before each series begins.

The following Check Sample Series (the number of samples being shown in parenthesis) are offered:

Cottonseed (10)
Soybeans (10)
Peanuts (7)
Safflower Seed (7)
Oilseed Meals (15)
Edible Fats (5)
Drying Oils (6)
Tallow & Grease (5)
Cottonseed Oil (4)
Soybean Oil (4)
Copra (4)
N.I.O.P. Fats & Oils (5)

Gas Chromatography (fatty acid composition) (6)
Cellulose Yield (cotton linters) (10)

Additional series will be offered should sufficient interest be indicated. Please advise the Smalley Committee of series you feel would be of value.

R. T. Doughtie, Jr., Chairman
Smalley Committee

ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: N. E. Bednarcyk, J. Covey, J. G. Endres, J. Iavicoli, F. A. Kummerow, E. G. Perkins, T. H. Smouse, J. A. Thompson and R. W. Walker

• Fats and Oils

Studies on wool wax. I. General rheological behavior. M. A. Kassem, A. A. Kassem and H. A. Salama (Lab. of Pharm. Sci., Nat. Res. Center, Dokki, Cairo, UAR). *Fette Seifen Anstrichmittel* **71**, 552–56 (1969). Wool waxes were studied for their general rheological behavior as a function of breed of animal and geographical locality. The rheological parameters studied included flow curve, structural viscosity at low as well as at high levels of shear, yield and plastic viscosity. The influence of temperature on these parameters was also considered.

Identification of polyhydric alcohols on thin-layer chromatograms with 2-thiobarbituric acid. M. A. Nisbet (Imperial Tobacco Co. of Canada Ltd., Montreal, Quebec, Canada). *Analyst* **94**, 811–12 (1969). A procedure is outlined for identification of glycerol, ethylene glycol and other polyhydric alcohols by thin-layer chromatography. Those with similar retention values are identified by their specific colour reactions with 2-thiobarbituric acid after oxidation with acidic dichromate.

Oil palm of Indian habitat. I. Technology of oil palm of Andhra Pradesh. T. Obi Reddy and S. D. Thirumala Rao (Oil Technological Research Institute, Anantapur, India). *Oils Oilseeds J. (Bombay)* **22**(2–3), 16–19 (1969). Samples of fruits and kernels from two African oil palm trees (dura variety) grown in South India were examined. The oil content of the pericarp averaged 77.3% (3.3% water), while that of the kernel averaged 49.0% (5.5% water). Cooking the fruit followed by either hydraulic pressing or centrifugation gave the best recovery of oil (70–80%). The physical and chemical characteristics of the palm oil and palm kernel oil were comparable to those reported in the literature.

Flammability of oilseed meals: causes and prevention. A. Uzzan (Service Documentation, ITERG, Paris). *Rev. Franc. Corps Gras* **16**, 713–19 (1969). It is possible for oilseed meals to burn although the risk of a fire is less than with solvents. Presscake meals can ignite spontaneously due to absorption of moisture from the air during storage. This hazard can be minimized by raising the moisture content of the meal to around 6% before storage. Meals from extraction processes can also ignite spontaneously due to moisture absorption. Because of their small particle size, they may pose a dust hazard and may be ignited by a spark of static electricity. Finally, residual solvent in the meal poses a special danger. The author describes each one of these hazards, the critical conditions for combustion and ways of safeguarding against fires.

Applications of N-bromosuccinimide to the study of unsaturated fatty acids and their glycerides. P. Mesnard, J. Loizeau, C. Chapard and M. Badiane (Faculty of Medecine and Pharmacy of Bordeaux). *Oleagineux* **24**, 631–3 (1969). N-bromosuccinimide (NBS) in a non-polar solvent adds bromine to a double bond in an allylic position. In a polar solvent (acetic acid or methanol), the bromine adds to the double bond directly. A procedure is described, based on this reaction, for determining unsaturation. After the reaction, KI is added and the liberated I_2 titrated with thiosulfate. The structure of the reaction products of various fatty acids with NBS is discussed.

The relationship between margarine consistency and the dilatometric characteristics of the base fat. E. Sambuc and M. Naudet (Lab. Nat. Des Matieres Grasses ITERG, Faculte des Sciences, Marseille). *Rev. Franc. Corps Gras* **16**, 701–12 (1969). The firmness index (ratio between the amounts of solid and liquid fat determined by dilatometry) of a margarine base oil shows a high degree of correlation with spreadability. An empirical relation of the form $C = kF^n$ was found between the consistency C measured by extrusion and penetration and the firmness index. The constants k and n were evaluated on a number of laboratory—produced samples. Their values depend on the conditions under which the margarines were produced.

Types of margarine required by different consumers. E. Jahan (I.M.A.C.E., Brussels). *Rev. Franc. Corps Gras* **16**, 691–4 (1969). The requirements of margarine consumers affect the position of margarine in the total fat market. The problem of producing industrial-type margarines for which the specifications are quite rigid is discussed. Because of the wide variety of formulas possible, margarines can be supplied to meet individual needs. The present situation and trends as affected by legislation, regulation, custom, distribution and publicity for these products are examined.

Importance of wheat lipoxidase in the oxidation of free fatty acids in flour-water systems. W. R. Morrison and E. A. Maneely (Univ. of Strathclyde, Glasgow, Scotland). *J. Sci. Food Agr.* **20**, 379–81 (1969). Wheat flour was extracted with water, and the aqueous extract and flour residue were used in mixing experiments. The enzyme system responsible for the pro rata oxidation of free fatty acids was present only in the flour residue, and lipoxidase was present only in the aqueous extract. It was calculated that lipoxidase could account for only a small proportion of the oxygen consumed in oxidizing free fatty acids, and the significance of wheat flour lipoxidase in dough rheology is therefore less than has been hitherto assumed.

Distribution of fatty acids in triglyceride from a yeast species grown on a fraction of n-alkanes predominant in tridecane. P. C. Harries and C. Ratledge (Unilever). *Chem. Ind. (London)* **1969**, 582–3. The results of studies on the triglycerides formed by a yeast grown on a fraction of n-alkanes rich in C_{13} are described, in terms of the fatty acid distribution between the primary and secondary positions of the glycerol molecule. The triglycerides studied are unusual because of their relatively high content of odd-numbered fatty acids.

Seed fats of the New Zealand iridaceae. I. M. Morice (Dep't of Scientific and Ind. Res., Wellington, New Zealand). *J. Sci. Food Agr.* **20**, 611–2 (1969). The seed fats of four species of *Libertia*, family Iridaceae, have been examined. Those of *L. grandiflora*, *L. ixioides* and *L. peregrinans* are similar to one another and have been found to contain as their predominant fatty acids: 11–22% myristic, 14–21% palmitic, 13–25% oleic and 35–57% linoleic. They differ from the New Zealand Agavaceae, Juncaceae and Liliaceae in containing major amounts of myristic acid. The fourth species, *L. pulchella*, contains less than 1% myristic, 19–26% palmitic, 9–20% oleic and 57–61% linoleic acids.

Theoretical triglyceride content of vegetable oils by a radiochemical technique. C. A. Marcopoulos and K. A. Manolkidis (Democritos Nuclear Res. Center, Athens, Greece). *J. Sci. Food Agr.* **20**, 459–63 (1969). The refining losses for a number of olive, corn and cottonseed oil samples, as determined in the laboratory by a chromatographic method, were checked by a radiochemical procedure. By labelling oil samples with ^{14}C-tripalmitate and applying the principle of isotope dilution analysis, the absolute content of neutral oil and the theoretical triglyceride content were determined. In order to examine the effect of sediment in an oil on the deviation of the chromatographic refining loss from the theoretical triglyceride content, various oil samples with high amounts of sediment were compared with normal samples having low or moderate sediment. Relationships are proposed for the calculation of the theoretical triglyceride content from the one determined by the chromatographic method.

Margarine composition and preparation thereof. J. T. Colburn (Armour and Co.). *U.S. 3,477,857.* The preparation and composition of a margarine product having an intensified butter flavor are described. The margarine product is utilized by blending with normal margarines or other shortening materials to yield a product capable of imparting a butter flavor to baked goods.

(Continued on page 194A)

ITERG Days of Information on Toilet Soap (Paris, June 16-19, 1970)

Among soap and personal hygiene products, toilet soaps have had a phenomenal development of their market during the last few years and their future looks equally promising. This is partly the result of an improved standard of living, which has caused customers to demand better products. It is also the result of scientific progress and improved manufacturing techniques. Consequently, the soap industry furnishes an attractive and diversified gamut of toilet soaps which have gained increased consumer acceptance.

It was considered to be of great interest to analyze the reasons for this situation from a technical viewpoint. Therefore, the Administrative Council of ITERG, in conjunction with the Association of Soaps, Detergent, and Personal Product, has decided to dedicate its 1970 Days of Information to Toilet Soaps.

These Days will take place in Paris on June 16–19, 1970, under the chairmanship of Mr. Cornu, president of the aforementioned association.

An organizing committee, headed by Mr. Bergeron of Colgate-Palmolive, has been working on the program, which promises to be not only of interest but to provide answers to all technical problems as well.

Some of the lectures will be on the following subjects: animal fats and fatty acids and their processing; the shortcomings of toilet soaps; analytic control of their properties; their structure; their purity; pharmaceutical soaps, bar detergents and mixed toiletry products.

The marketing of toilet soaps will also be dealt with. The major part of the conference will be devoted to round table discussions. The first, concerning the technology of toilet soaps, will enable the principal manufacturers of soap making equipment to describe their latest advances. The second will concern additives for toilet soaps, specifically perfumes, coloring agents, deodorants, etc.

For more information please write to: L'Institut des Corps Gras, 5 Boulevard de Latour-Mauburg, 75 Paris 7e, France.

European Meeting of Chemical Engineering and the Achema Congress 1970

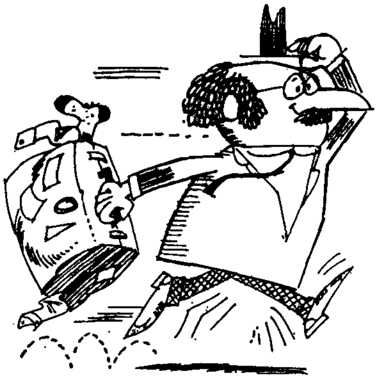
As the 95th event of the European Federation of Chemical Engineering, a European Meeting of Chemical Engineering and the Achema Congress will take place in Frankfurt am Main from June 17 to 24, 1970.

Reports by congress members on technical experiences and experimental results gained upon new developments will be presented in approximately 220 information lectures in the following 13 fields: New processes in chemical technology. Electrochemical measuring techniques. Water, exit gas, waste. Heat exchange. Rectification. Drying. Conveying and separation of particles. Mixing. Compiling and processing of measured data. Level and flow measurement. Large-scale physical apparatus for laboratories (gas chromatography, mass spectrometry, microwave spectrometry, electron optics). New structural materials for chemical engineering. Various subjects.

Besides the lectures, the "individual discussions around equipment on exhibit" will in particular make possible the exchange of experience between chemists and engineers, scientists and technicians, equipment manufacturers and users of equipment, and thus serve to promote research and development in the fields of chemical engineering and technical chemistry.

Over 2,000 firms, including 580 foreign firms from 22

(Continued on page 201A)



Meetings

AOCS National Meetings

Sept. 27-Oct. 1, 1970—Chicago, Conrad Hilton Hotel.
May 2-6, 1971—Houston, Shamrock Hotel.
Oct. 2-6, 1971—Atlantic City, Chalfonte-Haddon Hall Hotel.

AOCS Section Meetings

North Central Section—May 20, 1970, Ladies' Night Old Spinning Wheel, Hinsdale, Ill.
Northeast Section—June 2, 1970, Whyte's Restaurant, New York.
Southwest Section—May 21, 1970, Ladies' Night, Michael's Los Feliz Restaurant, Los Angeles, Calif.

Other Organizations

May 25-27, 1970—16th National ISA Analysis Instrumentation Symposium, Chatham Center, Pittsburgh, Penn.
May 26-27, 1970—25th Anniversary Meeting and dinner dance of the Society of Cosmetic Chemists, Americana Hotel, New York City.
June 3-5, 1970—2nd Central Regional Meeting of the American Chemical Society, Columbus, Ohio.
*June 7-12, 1970—Fourth ISA Process Analytical Instrumentation Short Course, Temple Buell College, Denver, Colorado.
June 9-12, 1970—14th International Conference on the Biochemistry of Lipids, Lund, Sweden.
*June 21-26, 1970—73rd Annual Meeting of the American Society for Testing and Materials, Royal York Hotel, Toronto, Canada.
June 23-25, 1970—Fourth International Sunflower Conference, Sheraton-Peabody Hotel, Memphis, Tenn.
June 22-27, 1970—14th International Congress of Esthetics and Cosmetology, Amsterdam, The Netherlands.
July 7-9, 1970—International Association of Seed Crushers, the Royal Garden Hotel, London, England.
July 26-August 1, 1970—5th International Water Pollution Research Conference, San Francisco, California.
Aug. 9-14, 1970—Third International Congress of Food Science and Technology, Washington, D.C.
Aug. 23-25, 1970—41st Annual Meeting of the National Soybean Processors Association, Fairmont Hotel, San Francisco, Calif.
Sept. 20-23, 1970—International Conference on the Science, Technology and Marketing of Rapeseed and Rapeseed Products, Chantecler Hotel, St. Adele, Quebec.
Oct. 11-14, 1970—Ninth Annual Meeting, ASTM Committee E-19 on Chromatography, Brown Palace Hotel Denver, Colorado.
Oct. 14-17, 1970—International Symposium on Computer Applications in Engineering Sciences, Istanbul Technical University, Istanbul, Turkey.
Oct. 12-15, 1970—84th Annual Meeting of the Association of Official Analytical Chemists, Marriott Motor Hotel, Twin Bridges, Washington, D.C.

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*Additions to previous calendar

(Continued from page 192A)

Preparation and use of a smoke-flavored edible oil. C. M. Hollenbeck (Red Arrow Products Corp.). *U.S. 3,480,446.* A process is disclosed for making a smoke-flavored edible oil by contacting the oil with an aqueous smoke-flavored solution.

Lecithin compositions. W. K. Hilty (Ross & Rowe, Inc.). *U.S. 3,480,544.* Novel, low cost, finely divided, free flowing compositions containing oils and a high lecithin content are disclosed.

Method of dewaxing rice oil. D. N. Kinsey and J. W. Hunnell (Riviana Foods Inc.). *U.S. 3,481,960.* Wax and other insoluble matter of rice oil are removed by chilling the oil or miscella, treating the same with a water solution of sodium silicate causing flocculation of the contaminant particles, and thereafter separating the wax floc from the oil by centrifuging and filtering.

Polyamide compositions of a polymeric fat acid and a mixture of diamines. D. E. Peerman and L. R. Vertnik (General Mills, Inc.). *U.S. 3,483,237.* An improved polyamide composition of polymeric fatty acids and a diamine is obtained by replacing a portion of the diamine component with the diamine of a polymeric fatty acid having a dimer content greater than 85% by wt. The products find particular utility in coatings and adhesives.

Process for preparing margarine. K. F. Gander and E. G. Becker (Lever Bros. Co.). *U.S. 3,488,199.* Margarine is prepared by forming an emulsion of a portion of the aqueous phase and a portion of the fat required, subjecting the balance of the fat to precrystallization, mechanical working and cooling, and thereafter combining the cooled precrystallized fat with the emulsion with gentle working.

Method for the removal of fatty acids from starches. W. G. Kunze (Nat. Starch and Chem. Corp.). *U.S. 3,485,669.* A method for effecting the extraction of substantially all of the fatty acid content of starches comprises an extraction procedure conducted at reflux temperatures and atmospheric pressure and utilizing a solvent system consisting of a mixture of dimethyl sulfoxide and a hydrophobic fatty acid solvent. The resulting defatted starches may, thereafter, be effectively used in food, adhesive and film-forming applications.

Quantitative thin-layer chromatography using a flame ionzation detector. J. J. Szakasits, P. V. Peurifoy and L. A. Woods (Shell Oil Co., Houston Res. Lab., P.O.B. 100, Deer Park, Tex. 77536). *Anal. Chem.* 42, 351–54 (1970). A flame ionization detector has been adapted to scan thin-layer chromatographic strips directly and produce a series of signals proportional to the amount of material present for each of the separated organic components. Thin-layer chromatographic separations are carried out on a metal-backed adsorbent strip that is passed directly between the nozzles of a dual-jet flame ionization detector. The signal from the detector is fed to an electrometer, recorder and digital integrator. The strip is scanned at sufficiently high temperature (300–400C) so that all of the sample is removed from the adsorbent by a single scan. Observed background electronic noise is very low and the high detector sensitivity permits use of very small samples. The apparatus is sturdy and easily constructed.

Extractable and "bound" fatty acids in wheat and wheat products. J. A. Inkpen, and F. W. Quackenbush (Purdue Univ., Agr. Exp. Sta., Lafayette, Ind. 47907). *Cereal Chem.* 46, 580–87 (1969). To provide quantitative data on the fatty acids in a broadly representative group of samples of wheat and wheat products, total lipid was obtained by extraction with chloroform-ethanol-water and subsequent hot acid hydrolysis of the extracted residue to obtain "bound" lipid. The chloroform-ethanol-water solvent was as effective an extractant as water-saturated *n*-butanol; however, both solvent systems extracted substantial amounts of non-lipid (hexane-insoluble) substance, and neither effected complete removal of lipid material from the sample as shown by subsequent acid hydrolysis of the extracted residue. The extractable lipid from wheat and wheat flour contained much more stearate, much less palmitate and usually more linoleate than the "bound" lipid removable only after acid hydrolysis. One hundred fifty-six samples of wheat, wheat flour and wheat consumer products were analyzed for total and individual fatty acids.

The evaporation resistance of mixed monolayers of nonideal surface solution of long-chain normal alcohols, acids and esters. Meng-Kun Lu, Jen-Feng Kuo, and Ching-Se Yen (Dept. of Chem. Eng., Provincial Cheng Kung Univ., Taipei, Taiwan, China). *Chemistry (Taipei)* 1–2, 7–17 (1969). The rate of evaporation of water was studied by spreading monolayers of *n*-hexadecanol, *n*-octadecanol, *n*-eicosanol, stearic acid, palmitic acid, ethyl stearate and their mixture on pure water surface. The rate of evaporation of water at 30C was measured by the rate of adsorption of water vapor by solid lithium chloride desiccant supported above the water surface. The specific resistance of mixed monolayers of *n*-long-chain alcohols and acids deviated from the ideal mixture law which is the linear relation between logarithm of specific resistance and the molar composition. When the specific resistance of pure alcohol monolayer was greater than that of pure acid monolayer, the mixed monolayer showed positive deviation. It behaved ideally at film pressure of 10 dyne/cm. On the other hand when the specific resistance of pure alcohol monolayers was smaller than that of pure acid monolayers, the mixed monolayers showed negative deviation.

The influence of various storage conditions on the compositions of rice lipid. Po-Tung Hsieh and Chien-Chun Yang (Inst. of Agr. Chem., National Taiwan Univ., Taipei, Taiwan, China). *Chemistry (Taipei)* 3, 37–45 (1969). The changes of lipid composition of Penglai and native rices during storage under various conditions were studied by gas chromatography and the following results were obtained. The free fatty acid content in rice lipid could be employed as a measure of rice quality. The fat-by-hydrolysis fraction remained unchanged in quantity, however, the quantity of neutral fat fraction decreased and that of free fatty acid fraction increased. The greater the change of rice lipid, the worse the rice quality. The major fatty acids in rice lipid were palmitic, oleic and linoleic with smaller amounts of myristic, stearic and linolenic. The deterioration in quality of rice and of hulled rice was considerably reduced by storage under nitrogen gas or at low temperature. There was a linear relationship between the increase of total free fatty acid content and the decrease of fatty acids combined in the neutral fat fraction. Free fatty acids were released from their corresponding combined form in the neutral fat fraction, with the unsaturated free fatty acids seemingly released more rapidly than the saturated. Unsaturated fatty acids were easily cleaved by oxygen.

Origin and nature of aroma in fat of cooked poultry. E. L. Pippen, E. P. Mecchi and M. Nonaka (USDA Western R&D Div., ARS, Albany, Calif. 94710). *J. Food Sci.* 34, 436–42 (1969). Odor panel results indicate characteristic cooked poultry aroma in fat of cooked poultry is derived from the lean portions of meat. Migration of sulfur substances into the fat during cooking supports this concept. The dependence of the magnitude of the sulfur buildup in fat upon cooking conditions, the nature of aroma components found in fat of roasted turkey and the readiness with which authentic amino acids are degraded in hot fat, all suggest that protein, amino acids, sugars and other water soluble components are involved in the formation of the characteristic aroma that accumulates in fat of cooked poultry.

Lipid oxidation in full-fat and defatted soybean flakes as related to soybean flavor. D. J. Sessa, D. H. Honig and J. J. Rackis (NRRL, Peoria, Ill. 61604). *Cereal Chem.* 46, 675–86 (1969). Extracting 99.8% of the oil from full-fat soybean flakes with pentane-hexane removed none of their green-beany, bitter flavor. This oil, with paraffinlike, vegetable-oil flavor, did not develop any further flavor on storage. Almost all the flavor and residual lipids from defatted soybean flakes were extracted by hexane-absolute ethanol azeotrope (79:21). The oil and azeotrope extracts had thiobarbituric acid (TBA) numbers of 5.8 and 34, respectively. In both full-fat and defatted flakes *n*-hexanal, acetaldehyde, and acetone represented the major volatile carbonyl compounds. From defatted flakes,

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TABLE III
Maize Oil[a,b]

Acids	Carbon atoms	Range
Saturated	Less than 14	<0.5
Myristic	14:0	<1.0
Palmitic	16:0	8 –19
Stearic	18:0	0.5– 4.0
Arachidic	20:0	<1.0
Behenic	22:0	....
Lignoceric	24:0	....
Palmitoleic	16:1	<1.0
Oleic	18:1	19 –50
Linoleic	18:2	34 –62
Linolenic	18:3	<1.0
Eicosenoic	20:1	<0.5

[a] Synonyms: corn.
[b] Fatty acid composition by gas chromatography (wt % of methyl esters).

TABLE IV
Mustardseed Oil[a,b]

Acids	Carbon atoms	Range
Saturated	Less than 14	<0.5
Myristic	14:0	<1.0
Palmitic	16:0	0.5– 4.5
Stearic	18:0	0.5– 3.0
Arachidic	20:0	<1.5
Behenic	22:0	0.2– 2.5
Lignoceric	24:0	<0.5
Palmitoleic	16:1	<1.0
Oleic	18:1	8.0–23.0
Linoleic	18:2	10.0–24.0
Linolenic	18:3	6.0–18.0
Eicosenoic	20:1	4.0–13.0
Erucic	22:1	22.0–49.0
Docosadienoic	22:2	<1.0
Tetracosenoic	24:1	0.5– 2.5

[a] Synonyms: none.
[b] Fatty acid composition by gas chromatography (wt % of methyl esters).

TABLE V
Rapeseed Oil[a,b]

Acids	Carbon atoms	Range
Saturated	Less than 14	<0.5
Myristic	14:0	<1.0
Palmitic	16:0	0.5– 5.0
Stearic	18:0	0.5– 3.0
Arachidic	20:0	<1.5
Behenic	22:0	<1.5
Lignoceric	24:0	<2.0
Palmitoleic	16:1	<1.0
Oleic	18:1	9.0–25
Linoleic	18:2	11 –25
Linolenic	18:3	5.0–12
Eicosenoic	20:1	5.0–15
Erucic	22:1	30 –60
Docosadienoic	22:2	<1.0

[a] Synonyms: colza, ravison, sarson, toria, turnip rape.
[b] Fatty acid composition by gas chromatography (wt % of methyl esters).

TABLE VI
Safflower Seed Oil[a,b]

Acids	Carbon atoms	Range
Saturated	Less than 14	<0.5
Myristic	14:0	<1.0
Palmitic	16:0	2.0–10
Stearic	18:0	1.0– 6.0
Arachidic	20:0	<1.0
Behenic	22:0	<1.0
Lignoceric	24:0	....
Palmitoleic	16:1	<0.5
Oleic	18:1	7.0–40
Linoleic	18:2	55 –80
Linolenic	18:3	<1.0
Eicosenoic	20:1	<0.5

[a] Synonyms: carthamus, durdee.
[b] Fatty acid composition by gas chromatography (wt % of methyl esters).

vention in the Washington-Hilton Hotel, Washington, D.C., Tuesday, April 2, 1968. The minutes of this meeting show that it was attended by five United States or Canadian delegates or advisors to the delegates to the Codex Committee on Fats and Oils, by four members of the American Oil Chemists' Society, and by two members from American industrial organizations.

At this meeting the requirements of the Codex Committee were set forth by the U.S. Delegates. This delegation had felt in the past that the proposal to use GLC in Codex standards had been premature because of insufficient knowledge of the ranges in fatty acid composition characteristics of some of the fats and oils. However recent developments in this field had led them to the opinion that Codex standards should utilize GLC analysis at least on an optional basis, otherwise standards based entirely on the classical fat and oil characteristics would soon become obsolete.

It was emphasized by the AOCS members that the major problem in establishing such standards is the need for a comprehensive survey of the variability in fatty acid distribution for each product for which standards are to be developed in order to establish completely valid and at the same time reasonable minimum and maximum requirements for such standards. It was agreed that the Codex delegation would furnish a list of the fats and oils for which standards were now required and that the AOCS, through its Instrumental Techniques Committee, would initiate the necessary survey to establish the minimum and maximum limits for each fatty acid in each specific fat or oil.

It was also agreed that in establishing these standards, the range for each fatty acid in each fat or oil would be broad enough to include all products ordinarily encountered in world trade, the complete range expected for commercial fats or oils, but not necessarily broad enough to include all products which might be encountered under exceptional conditions. Exceptional oils, it was pointed out, can result from agronomic or genetic advances to impart special properties to a specific oil. Three examples are given to illustrate such exceptional oils (where the minimum or maximum concentration or both of one or more acids might be outside of the normal range for oils of commerce.)

1. Safflower oil can be of high linoleic or high oleic variety. In the former, the 18:2 acid would be 55% to 80% and 18:1 7.0% to 40%; in the latter, the 18:2 would be 7.0% to 40% and 18:1 55% to 80%. To cover both, 18:1 would be 7.0% to 80% and 18:2 also 7.0% to 80%.
2. A rapeseed oil has now been developed which contains no erucic acid (22:1) so if this unusual variety was included, this component would be 0% to 60%, 22:1 instead of 50% to 60%.
3. The fatty acid composition for arachis oil has been found to be "unusual" in the following cited examples: Arachidic was found to be less than 1% in eight of 11 varieties studied (1). Lignoceric was found to be less than 1% in one out of three samples investigated by Craig and Murthy; for one out of seven varieties (2), and one out of 22 samples (3).

The delegates to the Codex Committee on Fats and Oils requested specifications for the following fats and oils: arachis oil (peanut oil) (groundnut oil), cottonseed oil, maize oil (corn oil), rapeseed oil, safflower oil, sesame seed oil, soya bean oil (soybean oil), sunflower seed oil, lard (rendered pork fat), and premier jus (edible tallow). Mustard seed oil was added to this list after the fifth meeting of the Codex Committee on Fats and Oils in London, September 16–20, 1968.

The Chairman of the Gas Chromatography Subcommittee of the Instrumental Techniques Committee prepared a list, from an exhaustive search of the literature, of the minimum-maximum range of fatty acid composition, as obtained by gas chromatography. These values were submitted to several

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