h = peak height
a = attenuation factor
M = molecular weight of the corresponding unacetylated component

Using this formula, the calculated composition of the glyceride mixture is compared in Table I with that found in several GLPC determinations at several temperatures. It may be seen that the results are in reasonably good agreement with each other.

It is hoped that these preliminary experiments will serve to increase interest in the quantitative estimation of mono- and diglycerides by gas chromatography.

V. R. Huebner
Armour and Company
Chicago, Ill.

REFERENCE

1. McInnes, A. G., Tattrie, N. H., and Kates, M., "The Application of Gas-Liquid Partition Chromatography to the Microestimation of Monoglycerides," presented at the 32nd Fall Meeting, American Oil Chemists' Society, Chicago, Ill. October 20–22, 1958.

[Received March 2, 1959]

Report of the Examination Board, 1958-1959

During the year ended May 31, 1959, among their various active members, 40 commercial laboratories were granted referee certificates from the A.O.C.S. Examination Board, as follows:

7—Cottonseed, Oil Cake and Meal, Fatty Oils, and Tallow and Grease
14—Cottonseed, Oil Cake and Meal, and Fatty Oils
7—Cottonseed, Oil Cake and Meal
2—Oil Cake and Meal, Fatty Oils, and Tallow and Grease
1—Oil Cake, Meal and Fatty Oils
6—Oil Cake and Meal
2—Fatty Oils
1—Tallow and Grease

All laboratories certified for Oil Cake and Meal were automatically certified for Protein Concentrates.

During the certificate year C. E. Worthington of Barrow-Agee's Decatur, Ala., laboratory was transferred to Memphis, Tenn., O. M. Bakke of Houston Laboratories, Houston, Tex., and R. M. Dillard, Texas Testing Laboratories, Dallas, Tex., have retired from active chemical participation.

The chairman extends his thanks to all members of the Examination Board and to R. W. Bates and his efficient Smalley Committee for their excellent cooperation.

R. T. Doughtie R. R. King
E. R. Hahn R. C. Stillman
N. W. Ziels, chairman

ABSTRACTS . . . . R. A. REINERS, Editor

ABSTRACTORS: Lenore Petschaft Africk, R. R. Allen, S. S. Chang, Sini'tiro Kawamura, F. A. Kummerow, and Dorothy M. Rathmann

• Fats and Oils

A Simplified Procedure for Synthesis of Oleic-1-C^{14} Acid. Susanne von Schuching and E. Stutzman (Radioisotope Ser. and General Med. Research, Veterans' Administration Center, Martinsburg, W. Va. and Dept. of Biochem., The George Washington Univ. School of Med., Washington 5, D.C.). *J. Org. Chem.* 24, 345–6 (1959). Bergström's method for the introduction of a C^{14}-atom in the carboxyl position by means of the nitrile synthesis was modified for small scale experiments.

Synthesis of Some Octenoic Acids. J. A. Knight and J. H. Diamond (The School of Chem. and the Engineering Expt. Sta., Georgia Inst. of Technology). *J. Org. Chem.* 24, 400–3 (1959). *Cis*-2-, -3-, -4-, and -6-octenoic acids were prepared by the catalytic semihydrogenation of the octynoic acids. *Trans*-3-, -4-, and -6-octenoic acids were obtained either directly or indirectly starting with a *trans* alkenoic acid obtained by a Knoevengal condensation. Physical properties, including infrared spectra, were determined for all of the acids and most of the intermediates. The infrared spectra of the *trans* compounds showed strong absorption in the region of 10.2–10.35 microns. None of the *cis* compounds showed absorption in this region.

Isolation from Butterfat of 14-Methyl Pentadecanoic (Isopalmitic) Acid. R. P. Hansen, F. B. Shorland, and N. J. Cooke (Fats Research Lab., Dept. of Scientific & Ind. Research, Wellington, New Zealand). *Chemistry and Industry* **1959**, 124. C_{16} iso acid 14-methyl pentadecanoic acid was isolated from unhydrogenated butter fat and identified.

Evidence for a New Oxygenated Fatty Acid in the Seed Oil of Chrysanthemum Coronarium. C. R. Smith, Jr., K. F. Koch, and I. A. Wolff (Northern Regional Research Lab., Peoria, Ill.). *Chemistry and Industry* **1959**, 259–60. A new epoxy fatty acid occurring in the seed oil of *Chrysanthemum coronarium* (family compositae) was named coronaric acid and its chemical structure proved to be *cis*-9:10-epoxy-*cis*-octadec-12-enoic acid.

Influence of the Extraction of Lipids from Flour on Gluten Development and Breakdown. A. H. Bloksma (Inst. for Cereals, Flour, and Bread T.N.O., Wageningen, The Netherlands). *Chemistry and Industry* **1959**, 253–4. The flour lipids play a role in the gluten development and breakdown. That the original dough properties are not restored completely upon reconstitution may be explained by either of the following three assumptions, namely (i) the contact with the solvent changes other flour constituents, e.g. the protein fraction; (ii) the flour lipids partly lose their essential properties during isolation, or (iii) upon reconstitution they do not reach the areas where they can exert their beneficial influence or reach these areas only after a long mixing time. Experiments also indicated that the mixing tolerance of a flour depends heavily upon the state of the flour lipids.

Unsaturated Fatty Acids of Butterfat. W. E. Scott, S. F. Herb, P. Magidman, and R. W. Riemenschneider (Eastern Utilization Research and Development Div., Agr. Research Ser., U.S.D.A., Philadelphia 18, Pa.). *J. Agri. Food Chem.* 7, 125–9 (1959). The presence of C_{10} to C_{18} monoethenoid acids in butterfat was confirmed; the C_{12} and C_{14} acids were predominantly the *cis*-form, while the C_{16} and C_{18} acids had both *cis* and *trans* double bonds. The nonconjugated dienoic acids were found to be a mixture of *cis-cis* and either *cis-trans* or *trans-trans* isomers. Conjugated dienoic acids were identified as *cis-trans* and *trans-trans* isomers. The trienoic, tetraenoic, and pentaenoic acids had the all-*cis* configuration.

Preparation of Oleic Acid—a Reagent for Determination of the Hardness of Water. G. I. Mikhaĭlov and R. M. Levina. *Trudy Vsesoyuz. Nauch.- Issledovatel. Inst. Khim. Reaktivov* **1956**(21), 90-2; *Referat. Zhur., Khim.* **1956** abstr. No. 54824. Oleic acid prepared from apricot (peach) kernel oil with a yield of 80–5% is applicable for the determination of the hardness of water by the oleic method of Technical Specifications of the Ministry of Chemical Industry of the U.S.S.R. No. 2501-51. (*C.A.* **53**, 4773)

Analytical Control of the Degree of Oxidation in Fats. G. Wode. *TVF* **29**, 141–50 (1958). Determination of the peroxide and the aldehyde numbers permits suitable evaluation of the degree of oxidation in fats. The aldehyde number provides information regarding the taste-retaining ability of deodorized fats. Examples are given of the employment of the analytical method in the production of oils, in storage, hardening, and refining of oils and in margarine manufacture. (*C.A.* **53**, 2645)

Infrared Absorption Spectra of Some Vegetable Oils. Yvonne Favier (E'cole nationale superieure chim., Paris). *Compt. rend.* **247**, 295–7 (1958). Absorption spectra between 6 and 15 μ of about 15 vegetable oils and derivatives are discussed in regard to interpretations of structures, adulteration, etc. Characteristic bands of individual oils or structure groups are mentioned, but detailed data are not presented. (*C.A.* **53**, 3527)

Detection of Pistacia Lentiscus Oil in Olive Oil. G. Condorelli (Univ. Catania, Sicily). *Boll. inform. ind. olearia e sapon.* **4**, 49–52 (1958). The ultraviolet spectrum of the unsaponifiable matter of the oil of the fruit of *Pistacia lentiscus* showed two characteristic peaks at 270–290 mμ. The following color reaction is also suggested: shake 10 g. oil with 15 cc. ethanol; to 1 cc. of the alcohol extract add 1 drop of diazoic reagent (*p*-nitroaniline 0.5% solution in 2% hydrochloric acid, sodium nitrite 0.5% solution) and 3–5 drops 10% sodium carbonate solution; a red color is obtained if at least 0.5% lentiscus oil is admixed with olive oil. The test can also be conducted by paper chromatography (ethanol, 75% solution, as the mobile phase), the spots being sprayed with diazotized *p*-nitroaniline and sodium carbonate. (*C.A.* **53**, 3527)

Effect of Untreated and Chlorinated Water on the Keeping Quality of Butter. J. Lewis, C. Allison, R. G. Druce, G. George, and S. B. Thomas (Univ. Coll. Wales, Aberystwyth). *J. Soc. Dairy Technol.* **11**, 186–93 (1958). Butter washed with contaminated water developed rancidity within 21 days at 37–41°F., whereas water from the same source containing 5 parts per million residual chlorine gave butter which retained good flavor for six weeks. No chlorine taint was detected in the butter washed with water containing as much as 200 parts per million. (*C.A.* **53**, 3525)

Addition of Extraneous Fats and Their Detection in Butter. M. Vitagliano and A. D'Ambrosio (Univ. Naples). *Ann. fac. agrar. univ. Napoli Portici* (Naples) **22**, 35–68 (1956–7). Many methods are compared: volatile acidity ratio, test with $NH_2OH \cdot HCl$ (Nelson, *C.A.* **50**, 11550*i*), tocopherols determination (Mahon, *et al.*, *C.A.* **49**, 9181*f*), the melting point of sterol acetates (Cannon, *C.A.* **49**, 9833*d*), and the Wollny number. The fractionation of the butter by means of absolute alcohol according to Phalerao, *et al.* (*C.A.* **50**, 14136*c*), and of the fat acids with urea according to Shipe (*C.A.* **50**, 2189*i*) are criticized. Sixty-three references. (*C. A.* **53**, 3524)

Phospholipides in New Zealand Dairy Products. III. Effect of Storage on the Phospholipides and on the Partition of Phosphorus in Butter. A. K. R. McDowell (Dairy Research Inst. Palmerston North, N. Z.). *J. Dairy Research* **25**, 475–9 (1958). Average values for the total phosphorus content of serums from unsalted butter samples and for the phosphorus content of the various fractions of the serums after partition with CCl_3CO_2H were: Total phosphorus, 83.6 mg.; acid-soluble phosphorus, 32.4 mg.; inorganic phosphorus, 28.8 mg.; acid-insoluble phosphorus, 51.2 mg.; and phospholipide phosphorus, 33.6 mg./100 gm. There was no evidence that decomposition of the phospholipides or other organic phosphorus compounds occurred in salted or unsalted sweet cream butters during storage at 10° for eight months. (*C.A.* **53**, 3522)

Nomograph for Determining Percent Concentration of Fat in Bakery Products. G. A. Kocharyan (Bread Baking Trust, Baku). *Khlebopekar. i Konditer. Prom.* **3**(10), 12–3 (1958). A nomograph is given for use with a refractometric method for determining fat in bakery products. (*C.A.* **53**, 3520)

Inositol and Scyllitol in Food Plants. P. Malngeau (School Pharmacy, Paris). *Qualitas Plant. et Materiae Vegetabiles* **3–4**, 393–404 (1958) (in French). A review with forty-three references. (*C.A.* **53**, 3519)

Chromatography of Sperm-Head Oil. Hiroshi Sakurai and Masao Fujiwara (Osaka Univ.). *Mem. Inst. Sci. and Ind. Research, Osaka Univ.* **15**, 229–34 (1958) (in English). Sperm whale head oil was segregated into wax and glyceride by elution chromatography.

Molecular Distillation of Sperm-Head Oil. Hiroshi Sakurai and Yasutaka Tozaki (Osaka Univ.). *Ibid.* **15**, 235–40 (in English). Sperm whale head oil was separated into wax and glyceride by a molecular pot still apparatus. Separation was improved by stirring the distilland. (*C.A.* **53**, 3739)

Peanut Oils of Domestic Production. II. Precipitation Temperatures (Bellier) and Fatty-Acid Composition. P. Cattaneo, R. Gimenez, and Alicio L. Colombo (Univ. Buenos Aires). *Anales asoc. quím. arg.* **46**, 179–95 (1958). The precipitation temperature (Bellier number) of peanut oils is related to the saturated fatty acid (C_{20} to C_{24}) content (the arachidic-behenic-lignoceric acid composition) and the iodine value of the oils. Results are based on a comparison of I.R.A.M. (Institue Argentina de Racionalizacion de Materiales) and A.O.A.C. techniques. Detection of peanut oils in olive oils is discussed. (*C.A.* **53**, 3739)

Determination of Gossypol by the Luminescence Method. S. N. Vil'kova and A. L. Markman. *Zhur. Priklad. Khim.* **31**, 1548–53 (1958). Gossypol, not luminescent in itself, quenches the luminescence of chloroform and acetone and the degree of quenching increases with the concentration of gossypol. However, the relation is not proportional. The luminescence of fluorescein, excited by the 336 mμ line (mercury lamp through a blue filter), is quenched by gossypol in proprtion to its concentration so that the log (I/I_0) *versus* concentration gossypol curves are linear functions. (*C.A.* **53**, 3737)

Determination of Small Quantities of Soap in Refined Oils. M. S. Levit, L. G. Bliner, and T. K. Loseva. *Masloboĭno-Zhirovaya Prom.* **24**(11), 35–6 (1958). Standard and bromophenol blue in acetone solution titration methods for the estimation of small quantities of soaps in refined oils are compared. (*C.A.* **53**, 3738)

Identification of Fatty Acids by Functional Derivatives. D. Lefort. *Oléagineux* **12**, 685–90 (1957). A review with twenty-five references. (*C.A.* **53**, 3738)

Carbamide Method for Fractionation of Fatty-Acid Mixtures. A. L. Markman and B. A. Kats. *Masloboĭno-Zhirovaya Prom.* **24**(11), 12–6 (1958). Effects of urea concentration, crystallization time, and temperature on the fractionation of a fatty-acid mixture and yields of fractions from cottonseed soap stock are discussed. (*C.A.* **53**, 3738)

Application of Urea-Adduct Segregation Method to Fats Containing Conjugated Fatty Acids. S. Sinha, S. R. Chakrabarty, and M. M. Chakrabarty (Univ. Coll. of Sci. & Technol. Calcutta). *J. Indian Chem. Soc. Ind. & News Ed.* **20**, 104–5 (1957). In urea-adduct formation the influence of melting point and solubility appears to subordinate to the influence of unsaturation. With decreasing unsaturation the conjugated acids have a marked tendency toward forming adducts with urea at less concentrations of the latter. The findings indicate that separabilities cannot be based on the melting points and solubilities, but the detailed structure of fatty acids must also be considered in each case. (*C.A.* **53**, 3738)

Component Fatty Acids from the Seed Fat of Caesalpinia Digyna. D. K. Gupta, B. T. R. Iyengar, and M. M. Chakrabarty (Univ. Calcutta). *J. Indian Chem. Soc. Ind. & News Ed.* **20**, 112–6 (1957). Low-temperature crystallization and ultraviolet absorption spectrophotometric analyses of the fatty acid from the seed fat of *Caesalpinia digyama* show myristic 0.6, palmitic 20.42, stearic 8.24, arachidic 1.4, behenic 0.19, oleic 30.25, linoleic 37.12, ethyl linolenate 1.68, and nonsaponifiables 0.13%. The composition of the seed fat shows that the oil, if available in commercial quantities (there is a possibility in the by-product industry), should be very suitable as a raw material for the soap and edible-fat industries. (*C.A.* **53**, 3737)

Obtusilic Acid. I. Synthesis of Trans-4-Decenoic Acid. Mituo Iwakiri (Kinki Univ., Fuse, Osaka). *Nippon Kagaku Zassi* (J. Chem. Soc. Japan, Pure Chem. Sect.) **78**, 1460–3 (1957). Obtusilic acid (4-decenoic acid) found in the seed oil of *Lindera obtusiloba* has not yet been synthesized. The newly synthesized acid was found to be *trans* isomer by infrared spectroscopy. The natural obtusilic acid differed from the synthesized acid in m.p. of *p*-bromophenacyl ester. Thus obtusilic acid was assumed to be the *cis* isomer.

Separation of a New Eicosatrienoic Acid from the Seed Oil of Podocarpus Nagi. Yoshito Koyama and Yoshiyuki Toyama (Nagoya Univ.). *Nippon Kagau Zassi* (J. Chem. Soc. Japan, Pure Chem. Sect.) **78**, 1223–4 (1957). The seed of this plant yielded 39.2% (on dry seed) yellow oil, $d^{20/4}$ 0.9228, $n^{20/D}$ 1.4774, acid no. 1.2, sapon. no. 187.0, iodine no. 158.8, unsaponifiable matter content (%) 0.55. This oil contained linoleic acid and, besides, a new eicosatrienoic acid, which was free of a triple bond, a double bond at the end, and congugated double bonds. This new acid did not form conjugated trienoic acid but only conjugated dienoic acid by alkaline isomerization. It was named podocarpic acid.

Fatty Oil of Incillaria Confusa and Its Sterol Component. Tatsuo Tanaka and Yoshiyuki Toyama (Nagoya Univ.). *Nippon Kagaku Zassi* (J. Chem. Soc. Japan, Pure Chem. Sect.) **78**, 1101 (1957). The oil from slugs, *Incillaria confusa* (9% of dry matter) had $n^{40/D}$ 1.4817, acid no. 47.9, sapon. no. 184.6, iodine no. 85.0, and unsaponifiable matter content (%) 23.23. The sterol consisted mainly of β-sitosterol and only 0.3% of $\Delta^{5,7}$-sterol.

Separation of Octadecadienoic and Octadecatrienoic Acids from the Oil of Cyprinis Auratus. Toru Takagi, Tsutomu Shimooka, and Yoshiyuki Toyama (Nagoya Univ.). *Nippon Kagaku Zassi* (J. Chem. Soc. Japan, Pure Chem. Sect.) **78**, 1690–4 (1957). The viscera, eggs, and body (excluding viscera and eggs) of this fresh-water fish contained 23.7, 3.0, and 3.2% oil (ether extract), respectively, with the following characteristics: $d^{20/4}$ 0.9238, 0.9462 (at 30°), 0.9242; $n^{20/D}$ 1.4766, 1.4750 (at 30°), 1.4774; acid no. 4.14, 4.25, 0.36; sapon. no. 186.6, 169.6, 189.5; iodine no. 154.2, 145.1, 161.3; unsaponifiable matter 1.67, 9.25, 0.42%. Fatty acids of viscera and egg oils were subjected to urea-adduct formation, the parts rich in dienoic and trienoic acids were combined, and they were converted to methyl esters, which were distilled to obtain methyl esters corresponding to C_{18}. Silica-gel chromatography, bromination, and ozone decomposition showed that the acids in this fish oil contained linoleic and linolenic aids.

The Wax and Hydrocarbons in Sawa-Millet Bran Oil. Mitsuo Kitamura and Tetsujiro Obara (Tokyo Univ. Education). *Nippon Nôgei-kagaku Kaishi* (J. Agr. Chem. Soc. Japan) **32**, 946–7 (1958). The bran oil from the seeds of *Panicum crusgalli* var. *frumentaceum* contained 1.1% waxy solid, which was separated into hot-alcohol-soluble part *(A)* and insoluble part *(B)*. *A* was wax consisting of ceryl alcohol, α-hydroxy-*n*-docosanoic acid, and cerotic acid, while *B* was hydrocarbons consisting of $C_{29}H_{60}$ and $C_{31}H_{64}$.

Paper Chromatography of Fatty Acids. XXVIII. Separation of Thiocyanogen Derivatives. H. P. Kaufmann and M. Arens. *Fette, Seifen, Anstrichmittel* **60**, 803–6 (1958). The R_f values of thiocyanogen derivatives of "critical" pairs of fatty acids are, owing to their higher polarity, greater than the free acids and their bromo derivatives. Thus, in lauric and linolenic acid with R_f values of 0.52 and 0.55, myristic and linoleic acids 0.48 and 0.49, and palmitic and oleic 0.37 and 0.35, the thiocyanogen derivatives of the unsaturated acids are 0.94, 0.89, 0.79, and permit chromatographic separation by diluting acetic acid to 70%, thus reducing the mobility of the saturated acid. (*C.A.* **53**, 3737)

Physical-Chemical Methods of Analysis of Fatty Materials and Their Derivatives. J. P. Wolff. *Inds. aliment. et agr.* (Paris) **75**, 639–48 (1958). A review with thirty-six references. (*C.A.* **53**, 3737)

The Variation of the Fat Content of Saury, Cololabis Saira, or the Northeastern Sea Area of Japan. Katsuo Nagakura (Tohoku Kaiku Suiken, Shiogama, Miyagi Prefect.). *Tôhoku-kaiku Suisan-kenkyujo Kenkyu-hôkoku* No. **7**, 54–9 (1956). The seasonal variation of the fat content of saury was examined during 1953–1955. The relation between the oil extracted by boiling and pressing and the total fish oil was found to be linear according to $Y = 1.44X + 46.9$, where X is the amount of extracted oil and Y the total oil. (*C.A.* **53**, 3737)

Refining of Glycerol Water from Contact Splitting of Fat by Ion-Exchange Resins. T. A. Chernushkina, N. I. Plyasunkova, and N. Ya. Vetrova. *Masloboino-Zhirovaya Prom.* **24**(11), 37–9 (1958). Only multiple ion-exchange columns can be used successfully to refine glycerol waters from the catalytic splitting of fats. The related properties of several resins are discussed. (*C.A.* **53**, 3737)

Use of Hydrogenated Fat for the Manufacture of Cocoa-Butter Substitute. I. Pokornyĭ, E. Maresh, and A. Makhanichek (Research Inst. Vegetable Oils and Fats, Ustinad-Labem, Strekov, Czech.). *Masloboino-Zhirovaya Prom.* **24** (11), 17–19 (1958). Manufacture of cocoa-butter substitute from hydrogenated peanut, sunflower, and rape oils by the use of crystallization method is discussed. (*C.A.* **53**, 3737)

Technology of Fats. LIII. Disintegration of Raw Materials. H. P. Kaufmann and J. G. Thieme. *Fette, Seifen, Anstrichmittel* **60**, 852–9 (1958). (*C.A.* **53**, 3736)

Properties of Olive-Kernel Oils Produced by Different Methods. Marie T. Francois and Suzanne Heinrich. *Compt. rend.* **247**, 222–5 (1958). (*C.A.* **53**, 2650)

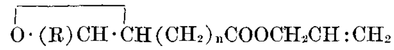
Effect of the Degree of Ripeness of Rapeseed on the Stability of the Rapeseed Oil. A. Rutkowske and Z. Makus. *Oléagineux* **13**, 203–5 (1958). The lipase activity and water content of rapeseed was determined daily for a period of sixteen days prior to harvesting. The lipase activity is a function of the water content of the seed and it decreases during the ripening process. Oil from fully ripe seed is more stable. The chlorophyll content of the rapeseed decreases during ripening while the tocopherol content increases. During five months' storage unripe rapeseed show a greater increase in free fatty acid and peroxide content than the fully ripe seed. (*C.A.* **53**, 2649)

Oil of Sesame. K. R. Varma (Tata Oil Mills Co. Ltd., Bombay). *Oléagineux* **13**, 793–801 (1958). A review with forty-nine references. (*C.A.* **53**, 2649)

Aleurites Moluccana. H. F. K. Dittmar. *Pharm. Zentralhalle* **94**, 393–400 (1955). This tree is widely dispersed through the tropical areas of the world. Oil content of the kernel (average 64%) is highest of any member of the genus. Physical properties and chemical constitution of the nut oil were determined. (*C.A.* **53**, 2649)

Experiments with Auto-Ignition. S. Bergman and B. Lindberg. *Färg och Fernissa* **22**(3), 6–8 (1958). Auto-ignition experiments were made in a Mackey apparatus in which the cotton had been replaced by 30 g. sawdust (>0.4 mm.) soaked with 30 ml. of the oil sample. Cooked or drier-containing linseed oil ignited earlier than did raw oil. Linseed oil fatty acid not containing driers ignited just as well as the raw oil. The fatty acid of dehydrated castor oil ignited as easily as linseed oil fatty acid and raw linseed oil and more readily than dehydrated castor oil. The ignition time decreases with increase in iodine number of the sample. (*C.A.* **53**, 2649)

New Utilizations of Synthetic Fatty Acids Prepared by Oxidation of Paraffin. I. V. Nicolescu, E. Angelescu, and P. Varsilesco (Univ. Bucarest, Romania). *Rev. franç. corps gras* **5**, 384–91 (1958). An entirely new class of compounds corresponding to formula



$$\overbrace{O\cdot(R)CH\cdot CH}(CH_2)_nCOOCH_2CH{:}CH_2$$

was obtained by esterification of unsaturated fatty alcohols prepared from two fractions containing, respectively, C_7–C_{12} and C_{14}–C_{20} saturated fatty acids fabricated by a Romanian factory with allyic alcohol leading to esters with iodine number of, respectively, 156 and 141, followed by epoxidation with acetic acid-hydrogen peroxide-sulfuric acid mixture in benzene solution. The simultaneous presence of the reactive epoxy and allylic group allowed the preparation of high-molecular compounds by polymerization or polycondensation with and without maleic acid; some examples of such compounds are given, and it is shown by enumeration of physical data that they can be utilized in order to modify advantageously the mechanical properties of varnishes or for the preparation of products forming highly resistant films. A similar product was obtained by employing cotton oil fatty acids for the preparation of such a compound, and condensing it with maleic acid at 150–180°. (*C.A.* **52**, 21168)

Physical and Chemical Characteristics of Oils at Different Stages of Maturity of the Seed of Several Plant Species. A. A. Vidal (Univ. La Plata, Arg.). *Rev. fac. agron. La Plata* **32**, 159–71 (1956). Analyses of the seed oils of *Brassica campestris*, flax, *Carthamus tinctorius*, sunflower, sesame, and soybean at three stages during a month's growth showed an increase in oil content, decrease in free acid, and increase in iodine number. The changes were small in the oils of *Brassica campestris*, sesame, and soybean. The acidity of *Carthamus tinctorius* oil increased, possibly because of increase in concentration of the acidic colored component. Changes in index of refraction were slight. (*C.A.* **53**, 2649)

ADDUCT FORMATION OF LONG-CHAIN FATTY ACIDS WITH UREA. K. Taüfel, G. Müller, and Cl. Franzke. *Nahrung* **2**, 255–67 (1958). A difference in chain length of more than two carbon atoms is needed for satisfactory separation by forming urea adducts. Methyl esters can be separated as readily as their fatty acids. A longer reaction period without stirring, such as overnight standing of the fatty-acid solution with urea, gives better separation than a few hours with stirring. Methyl alcohol is better than solvents such as ethyl ether, ethyl alcohol, propyl alcohol, butyl alcohol, or chloroform. The addition of urea in several small portions results in smaller yields but more selective separation. The higher the concentration of a given fatty acid in the mixture, the more complete is its separation. (*C.A.* **53**, 2648)

PAPER CHROMATOGRAPHY OF HIGHER SATURATED FATTY ACIDS. Sobeslav Fiker and Václav Hájek (Ustav hygieny, Prague). *Chem. listy* **52**, 549–51 (1958). A paper-chromatographic method for higher saturated fatty acids was modified for the separation of acids containing more than 24 carbon atoms. (*C.A.* **53**, 2647)

FLAVOMATICS FROM FAT. J. J. Broderick (Lever Bros. Co., New York, N.Y.). *Am. Perfumer Aromat.* **72**(5), 49, 51–2, 56 (1958). Fats containing low-molecular-weight fatty acids in their triglycerides (e.g., milk fat, coconut oil) are important flavorwise. Some flavomatics derived from fats are used in strawberry and other flavors, although those from proteins and carbohydrates are more important. Twenty-eight references. (*C.A.* **53**, 2502)

REACTION OF METHYL RICINOLEATE AND TERT-BUTYL CHROMATE. Senjiro Maruta and Yoshihito Suzuki (Yamanashi Univ., Kofu). *Kôgyô Kagaku Zasshi* **60**, 31–3 (1957). Methyl ricinoleate was oxidized by tert-butyl chromate to give an oxidation product in 71% yield. The results showed that the oxidation of hydroxyl radicals in methyl ricinoleate forms methyl 12-oxoöctadecenoate and that part of methyl ricinoleate is polymerized or condensed while other parts decompose into enanthic acid, enanthaldehyde, undecylenic acid, and caproic acid. *Cis*-methyl ricinoleate is partly changed to *trans*-methyl ricinoleate. (*C.A.* **53**, 4126)

THE SYNTHESIS OF LONG-CHAIN FATTY ACIDS. II. STRAIGHT CHAIN ALKANOIC ACIDS. H. P. Kaufmann and W. Stamm (Univ. of Münster, Ger.). *Chem. Ber.* **91**, 2121–6 (1958). Chain-lengthening of fatty acids is achieved by adding the acid chlorides to C_2H_4, dehydrochlorinating the resulting 2-chloroethyl alkyl ketones, oxidizing the vinyl ketones with potassium permanganate to α-oxo acids, and reducing, or by treating the 2-chloroethyl alkyl ketones with potassium cyanide or with $NaCH(CO_2C_2H_5)_2$ and hydrolyzing the condensation products to β- and γ-oxo acids, respectively, which are finally reduced to the fatty acids. (*C.A.* **53**, 4118)

THE ESTIMATION OF FAT IN RICE. Josepha M. M. Luykx. *Intern. Tijdschr. Brouw. en Mout.* **17**, 222–3 (1958). The rice meal is extracted in a Soxhlet apparatus with carbon tetrachloride. The latter is distilled and the residue dried at 105–7°. (*C.A.* **53**, 4603)

THE SURFACE LAYERS OF MILK-FAT GLOBULES. IV. THE CHOLESTEROL CONTENT (FREE AND ESTERIFIED CHOLESTEROL) OF THE SURFACE LAYERS. H. Mulder and T. A. Zuidhof (Agr. Univ., Wageningen, Neth.). *Neth. Milk Dairy J.* **12**, 173–9 1958). Cholesterol contents of milk fat, milk-fat globules, and milk serum were: 286 ± 7, 322 ± 9, and 2.2 ± 1.2 mg./100 g., respectively. About ¾ of the total cholesterol in milk was in the fat, ⅒ in the membranes, and the rest in the serum. About 15% of the cholesterol was esterified. (*C.A.* **53**, 4509)

CURRENT IDEAS ON THE DETERMINATION OF FATS IN MILK. J. Pien. *Mises au point chim. anal. pure et appl. et anal. bromatol.* **3**, 85–132 (1955). A review with seventy references. (*C.A.* **53**, 4509)

RECENT RESEARCH ON THE ORIGIN OF MILK FAT. R. F. Glascock (Natl. Inst. Research Dairying, Shinfield, Engl.). *Proc. Roy. Soc.* (London) **B149**, 402–13 (1958). A review concerning the nonlipide and the lipide precursors of the fatty acids of butterfat, and the origin of its glycerol. Forty-five references. (*C.A.* **53**, 4598)

DETECTION OF MUSTARD OIL IN OTHER EDIBLE OILS. S. N. Mitra, B. R. Roy, and P. N. Sengupta (Central Food Laboratory, Calcutta 16). *Current Sci.* (India) **27**, 221 (1958). The test proposed is essentially the method in *Methods of Analysis A.O.A.C.*, 8th ed., p. 517, **1955**, for volatile oil of mustard in which allyl isothiocyanate is determined. A dark color on addition of silver nitrate to the distillate, which can be quantitatively estimated, is considered positive evidence of allyl isothiocyanate. This compound is not found in significant amounts in other oils. (*C.A.* **53**, 4595)

COSTUS-ROOT OIL AND LACTONIC CONSTITUENTS THEREFROM. Govind Ramachandra Kelkar and Sasanka Chandra Bhattacharyya (Council of Scientific and Industrial Research). *Indian 59,853.* Costus-root oil was extracted from costus-root powder with a yield of 6.2%. A total of 250 g. of "constanolide" and "neocostanolide" were isolated and separated from 450 g. of oil. (*C.A.* **53**, 4779)

SOLVENT EXTRACTION OF COTTONSEED OIL. N. K. Roy Chaudhuri and S. K. Nandi (Ind. Inst. Technol., Kharagpur). *J. Indian Chem. Soc., Ind. & News Ed.* **19**, 87–94 (1956). Cottonseed after delinting and dehulling was extracted with benzene, alcohol, and solvent oil under different operating conditions. Extraction was done by mechanical mixing of the solvent with dehulled seed and also in an attrition mill to have simultaneous pulverization and extraction. Benzene was the best solvent, and 98% extraction has been obtained. (*C.A.* **53**, 4775)

THE SELECTIVITY OF HYDROGENATION OF SUNFLOWER OIL WITH FORMATE NICKEL CATALYST. G. I. Kolesnikov. *Trudy Krasnodarsk. Inst. Pishchevoĭ Prom.* **1955**(11), 81–2; *Referat. Zhur., Khim.* **1956**, Abstr. No. 56473. The effect of temperature (180–220°) on the "radical" selectivity of hydrogenation of sunflower oil (iodine number 121.9; content of acids [in %]: saturated 9.8; oleic 39.5; linoleic 50.7) with the use of 0.075% (based on nickel content) fresh and depleted formate nickel catalyst, without a carrier, was studied. The speed of the hydrogen flow was 3 liters per minute; saturation of oil was to an iodine number of 88–90. The degree of selectivity (ratio of hydrogenation of linoleic and oleic acids) did not depend on the temperature. The depleted catalyst acted more selectively under the same conditions of hydrogenation. (*C.A.* **53**, 4775)

ANALYSIS OF TRICHILIA QUADRIVALVIS SEED, OLEAGINOUS PLANT FROM THE KWANGO PLAIN. J. P. J. Casier (Univ. cathol. Leuven, Belg.). *Bull. agr. Congo Belge* **49**, 1301–5 (1958). *Trichilia quadrivalvis* seed contained 46–56% of clear green viscous oil with iodine number 33.5, saponification number 221, n_{25} 1.48435, *n* (butyro) 84.45. The oil cake contained about 20% protein. (*C.A.* **53**, 4775)

EXTRACTION OF SOYBEANS. MECHANISM WITH VARIOUS SOLVENTS. D. F. Othmer and W. A. Jaatinen (Polytechnic Inst. of Brooklyn, Brooklyn, New York). *Ind. Eng. Chem.* **51**, 543–6 (1959). The mechanism of vegetable oil extraction is unclear; and equipment design is empiric. Earlier studies gave a theory for one system and demonstrated a method for equipment design based on simple laboratory determinations. Soybean flakes of different thicknesses were extracted in nine solvents. Physical testing requires only a balance, laboratory glassware, and shaker. The single solvent, hexane, previously used, extracted at the same rates when containing up to 20% oil. Most present solvents extracted more slowly when containing more than 10% oil, with less residual oil in flakes when solvent contained less oil. This is a function of density times surface tension divided by viscosity, a term which appears in a modified Hagen-Poisenuille equation defining the machanism. The theory and design methods were generalized; simple contacting was as effective as countercurrent operation at low miscella concentrations. These simply determined laboratory data allow immediate design of plant extractors.

THE USE OF HIGH EFFICIENCY CAPILLARY COLUMNS FOR THE SEPARATION OF CERTAIN CIS-TRANS ISOMERS OF LONG CHAIN FATTY ACID ESTERS BY GAS CHROMATOGRAPHY. S. R. Lipsky, J. E. Lovelock, and R. A. Landowne (Department of Medicine, Yale Univ., New Haven, Conn.). *J. Am. Chem. Soc.* **81**, 1010 (1959). Preliminary experiments employing capillary columns containing certain polyesters as stationary liquids provided the rapid resolution of most components including linoleate and linolenate with good separation factors but low theoretical plate efficiencies.

THE EFFECT OF UREA AND ETHANOL ON SELECTIVITY OF THE FRACTIONATION PROCESS FOR FATTY ACIDS OF COTTONSEED OIL. B. A. Kats and A. L. Markman. *Doklady Akad. Nauk Uzbek. S.S.R.* **1957**(4), 45–9 (in Russian). The influence of varying amounts of urea and solvent (ethyl alcohol) on fractionation of cottonseed oil fatty acids is studied. The various distributions of the individual fatty acids between precipitate and solution are tabulated. A complete separation of saturated and oleic acid (precipitate) from linoleic acid (in solution) was not attained. (*C.A.* **53**, 4773)

KINETICS FOR THE OXIDATION OF FATS. D. G. Knorre, Yu. N. Lyaskovskaya, and N. M. Emanuel. *Bull. Acad. Sci. U.S.S.R.*, *Div. Chem. Sci.* **1957**, 693–8 (English translation). (*C.A.* **53**, 4773)

Degree of Polymerization of Linseed Oil. M. Taniewski and L. Bulczyńska (Inst. Dyes and Lacquers, Gliwice, Poland). *Przemysł Chem.* **35**, 324–5 (1956) (English summary). Linseed oil was polymerized by heat alone at 265, 285, and 305° and polymerized by heat and air (4–5 liters per minute) at 100, 150, and 285°. Determination of iodine number (A), bromine number (B), and application of $1.58B - A = X$, gave a measure of degree of oil polymerization. However, the differences in X of oil polymerized to 3–30 poises were small. (*C.A.* **53**, 4768)

Seed Oils of Podocarpus Nagi and Nine Other Japanese Plants. Y. Koyama and Y. Toyama. *Mem. Fac. Eng., Nagoya Univ.* **9**, 140–6 (1957). The oils of *Viburnum erosum, Ligustrum japonicum, Hibiscus mutabilis, Ilex integra, Ilex macropoda, Ilex serrata* var. *sievoldii, Pourthiaea villosa, Smilax china,* and *Smilax nipponica* were analyzed. The bromination test on the fatty acids of each oil showed the presence of linoleic acid and the absence of linolenic acid. The presence of oleic acid in the fatty acids of *V. erosum, H. mutabilis, L. serrata,* and *P. villosa* oils was demonstrated by separating elaidic acid from the elaidinized product of the liquid fatty-acid fraction. The fatty-acid composition for each oil except *P. nagi* was estimated by ultraviolet absorption measurements of the alkali-isomerized fatty acids; these results checked satisfactorily for a few oils with the lead salt-ethyl alcohol method. The fatty acids consisted of approximately 90% linoleic and oleic acids and 10% saturated acids. The oil of *P. nagi* was found to contain, besides linoleic acid, a new eicosatrienoic acid named podocarpic acid. (*C.A.* **53**, 2649)

The Separation of Saturated and Unsaturated Fatty Acid Esters by Gas-Liquid Chromatography. B. M. Craig and N. L. Murty (Natl. Research Council Can., Saskatchewan). *Can. J. Chem.* **36**, 1297–1301 (1958). Gas-liquid chromatography has been applied to the analysis of fats and oils in synthesized plasticizers which release stearic, oleic, linoleic, and linolenic acid esters, and which do not bleed. The columns, made of copper tubing (12 ft. x 0.25 in.) were packed with 1:4 silicone grease on 20–40-mesh firebrick. Plasticizer columns were constructed of the same copper tubing 6 ft. long packed with 1:4 diethylene glycol adipate or diethylene glycol succinate on the firebrick; these plasticizer columns being coupled in series, the succinate column being first. The succinate column separated the stearic and oleic acid esters; the adipate column, the linoleic and arachidic acid esters. The methyl esters of soybean oil were separated with the plasticizer column into palmitic, stearic, oleic, linoleic, and linolenic acids. Tallow esters with a silicone column were separated into the saturated even-number carbon atom acids C_8–C_{18}, also the C_{15} and C_{17} saturated acids were observed; likewise peaks between C_{14} and C_{15} and also between C_{16} and C_{17}, which may have been branched-chain acids. The plasticizer column showed additional peaks probably due to unsaturated acids of various chain lengths. Herring-oil esters showed odd-number fatty acids from C_9 to C_{15} and the expected even-number carbon acids with a silicone column. Lard esters showed even-number fatty acids C_{10}–C_{20} on a silicone column, and some unsaturated acids on plasticizer column. (*C.A.* **53**, 2647)

Analytical Study of the Alkaline Neutralization of Oils. M. Naudet, C. Drap, and S. Bonjour (Fac. sci., Marseille). *Rev. franç. corps gras* **5**, 557–65 (1958). The neutralization at 60–80° of 10-kg. samples of edible oil was studied by two methods: (a) in a single stage with theoretical quantities of sodium hydroxide; and (b) in two stages beginning with 60–70% of the theoretical and then, after separation of the layers by centrifugation, completing with an additional portion of sodium hydroxide. Three oils of 7.0, 6.8, and 3.8 acidity, treated according to a, showed, respectively: residual acidity of 0.12, 0.19, 0.14%; nonglycerides 0.51, 0.69, 0.57; the "inevitable losses" 7.70, 6.75, 4.15%; and the glyceridic losses 5.0, 4.35, 2.50%. With the first-stage treatment of b there was an economy of 10–15% of sodium hydroxide, and the final acidities varied between 0.09 and 0.13%, monoglycerides 0.24–0.52%, glyceridic losses 2.25–4.25%. With the completion of the second stage of b, monoglycerides were 0.19–0.27. Glyceridic losses were similar to that of the a, but the color of the neutralized oils expressed in trichromatic figures was superior. (*C.A.* **53**, 4595)

Wax Crystal Structure Versus Water-Vapor Transmission. R. C. Fox (Califormnia Research Corp., Richmond). *Modern Packaging* 32(2), 141–149, 196 (1958). Microscopic and x-ray diffraction measurements indicate that water vapor does not penetrate wax crystals on the surface of waxed cellophanes, but rather passes between them. Large wax plate crystals, oriented parallel to the base sheet, give a low water-vapor transmission rate. Formation of these large oriented plate crystals is aided by air cooling of the wax film or by recrystallization and reorientation of the water-cooled wax film during storage. An increase in storage temperature accelerates the rate of recrystallization and reduces the water-vapor transmission rate. (*C.A.* **53**, 2650)

Waxes. XIII. Refining Sugar-Cane Wax by Fractionation from Solvents. H. H. Hatt and A. H. Redcliffe (C.S.I.R.O., Div. Ind. Chem., Melbourne). *Australian J. Appl. Sci.* **9**, 380–403 (1958). Aqueous and anhydrous solvents and solvent mixtures were compared in refining the crude sugar-cane wax recovered from the filter cake of sugar mills of Australia. This wax can be resolved by certain solvents in two simple steps into fat, hard-wax and pitch fractions. The hard-wax fraction can then be bleached readily by air alone. The fat fraction must be removed from sugar-cane wax, otherwise more than two separations are needed. Of various solvents investigated a 4:1 mixture of ethyl alcohol:C_7H_{16} (or an equivalent petroleum fraction) is the most suitable for Australian conditions. (*C.A.* **53**, 4777)

Waxes. V. Charrin. *Peintures, pigments, vernis* **34**, 513–14 (1958). Compositions of commercial synthetic waxes are discussed. (*C.A.* **53**, 4777)

Miscella Refining. R. O. Schmitt (Buckeye Cellulose Corp.). *U.S. 2,878,275.* In the refining of vegetable oils, a solution of the crude oil in a volatile solvent is mixed with foots, and then treated with alkali.

Transesterification of Triglycerides by Means of Plural Metal Catalyst. G. Y. Brokaw (Eastman Kodak Co.). *U.S. 2,879,281.* In a continuous process, a mixture of higher fatty acid triglycerides and lower fatty acid triglycerides is transesterified by heating in the presence of a plural metal soap catalyst. The catalyst contains at least one alkali or alkaline earth metal soap and at least one saop of an amphoteric metal. The reaction mixture is fractionated by thin film vacuum distillation so as to separate a mixed triglyceride containing at least one higher acyl radical and at least one lower acyl radical.

Separation of Components of Oleaginous Mixtures by Fractional Crystallization. International Research and Development Corp. *Brit. 801,102.* A continuous and (or) batch process provides for the removal of undesirable high-freezing stearins from vegetable and animal oils and fats, by treating a miscella of approximately 45% by weight of oil and 55% suitable solvent, e.g., hexane. The mixture is cooled in thirty minutes to the temperature at which turbidity first appears, then more slowly to a temperature intermediate between the temperature of turbidity and the gelling temperature. A low viscosity permits rapid separation of solute crystals from the miscella. Small amounts of moisture present in the oil crystallize to form tiny nuceli which promote the crystallization of the stearins. (*C.A.* **53**, 4778)

Purification of Glycols, Especially Ethylene Glycol. Norvik Ackroyd and Wm. A. O'Neill (Imperial Chemical Industries Ltd.). *Brit. 801,723.* Addition of water to a crude glycol prior to distillation results in a product of high purity and stability towards heat. (*C.A.* **53**, 4778)

Wax Pastes. W. Hessler (Werner & Mertz Akt.-Ges.). *Ger. 936,228,* and *Ger. 938,146.* Stable wax pastes which do not dry and have good plasticity are obtained by mixing and homogenizing waxes, paraffins, and coloring materials with the solvent at room temperature or a little above. Waxes and solvents can be used of the same type as before, but heating energy, cooling energy, and time for stabilizing are decreased. More material of low quality can be used to give pastes of equal quality to those produced by melting and cooling more expensive raw materials. (*C.A.* **53**, 4779)

Dehydration of Low-Molecular Fatty Acids. C. Coutor (Lambiotte & Cie. S. à. r. l.). *Ger. 957,122.* (*C.A.* **53**, 4778)

Light-Colored Waxes with a High Content of Montanic Acid. W. Presting and G. Walther. *Ger. (East) 11,873.* Upon treating mixtures of montan wax and solid paraffins with both nitric acid and another mineral acid (phosphoric acid or sulfuric acid) the resins settle, the esters are hydrolyzed, and the resulting alcohols are oxidized to montanic acid. A hard yellow-white wax, acid number 90, saponification number 115, melting at 80°, was obtained by this method. (*C.A.* **53**, 4779)

Hard Polishing Waxes. O. Klein, W. Presting, and G. Walther. *Ger. (East) 12,543.* Addition to *Ger. (East) 7997.* Mixtures of equal amounts of resin-free or resinous crude montan waxes with macroparaffins from Fischer-Tropsch synthesis or with higher-melting hard-wax fractions are hot refined by use of at least 70% sulfuric acid. The extraction of resin from the crude montan wax is accomplished by means of nitric acid or by treatment with selective solvents in the presence of hard portions of the macroparaffins. Refined waxes of excellent hardness, good oil-binding capacity, and a light color are obtained. (*C.A.* **53**, 4779)

Reclamation of Oil and Bleaching Clay. Venktraman Sethuraman, Rajendra K. Bhatnagar, and Narasing R. Kuloor (Shri Ram Institute for Industrial Research). *Indian 61,157.* Filter-press mud from vanaspati factories or semi-tar industries is extracted with an organic solvent to remove fatty and oily matter from spent bleaching clay, and the bleaching clay thus obtained is activated by heating at 400–600° for 1–60 minutes. The organic solvent used is an azeotropic mixture of benzene and alcohol or an azeotropic mixture of alcohol with benzene, toluene, or trichloroethylene. (*C.A.* **53**, 4779)

Refining of Sugar-Cane Wax. Ram S. Dubey and Walchandnagar Industries Ltd. *Indian 61,413.* Crude sugar cane wax (10 g.), melting at 63°, was taken up with 25 ml. water, heated, and maintained at 75–80°. A stream of chlorine was passed in. After about six hours, the blackish green wax became yellowish brown. It was washed several times with hot water and dried. It melted at 65° and contained 7.5% chlorine. (*C.A.* **53**, 4779)

Continuous Hydrolysis of Fatty Products. G. Mazzoni S.p.a. *Ital. 550,134.* A two-step process and apparatus is described for the hydrolysis and for recovery of the reaction products. The fatty material is hydrolyzed with water at high temperatures and pressures and introduced into a distilling chamber under vacuum to recover most of the liberated acids; the residue is then carried through a second hydrolysis and distillation. Fat splitting is 98–99.5% complete. (*C.A.* **53**, 4778)

Extraction of Fat from Palmetto. R. M. Morales. *Span. 237,471.* The palmetto in a more or less size-reduced state is shaken in a tightly closed container with carbon disulfide for 60–75 minutes, after which time the carbon disulfide is drawn off and placed in another container, where it is distilled with steam, so that the fat remains. (*C.A.* **53**, 3741)

Demulsifier. V. Ya. Masumyan and M. K. Danielyan. *U.S.S.R. 113,860.* A demulsifier is obtained by air oxidation of the gas oil-solar oil fraction at 140–50° in the presence of calcium naphthenate as catalyst. (*C.A.* **53**, 3741)

Removal of Bitter Taste and Odor from Whale Oil. Seiji Tada and Ohki Nakayama. *Japan. 2841 ('58).* Whale oil (10 kg.) is homogenized with 100 g. casein in 1.5 l. water and sodium hydroxide to neutralize. The emulsion is separated by centrifuging to obtain 9.8 kg. odorless oil. (*C.A.* **53**, 4607)

Apparatus for Digestion of Wheat Oil. Torao Murakami (Nippon Fishery Co.). *Japan. 9987 ('58).* (*C.A.* **53**, 4779)

FATTY ACID DERIVATIVES

Synthesis of Fatty Acid Nitriles. P. V. Naumenko and B. A. Khaskin (All-Union Sci.-Research Inst. Fats, Moscow). *Masloboino-Zhirovaya Prom.* **24**(10), 13–15 (1958). A review with eight references. (*C.A.* **53**, 2082)

Reactions of Unsaturated Fatty Alcohols. IV. Oxidative Degradation of Lauryl Isopropyl Ether. L. E. Gast, C. B. Coleman, and H. M. Teeter (The Northern Utilization Research and Development Div., Agr. Research Ser., U.S.D.A.). *J. Org. Chem.* **24**, 160–5 (1959). Lauryl isopropyl ether containing catalytic amounts of cobalt naphthenate was degraded with oxygen at 150°. Isolated oxidation products indicate attack at both carbon atoms adjacent to the ether oxygen. Degradation products isolated were lauric acid, acetone, isopropyl laurate, lower fatty acids from C_2 to C_{11} and their esters, carbon dioxide, isopropyl alcohol, and polymerized acidic products. Lauric acid and isopropyl laurate were oxidized under the same conditions as lauryl isopropyl ether. Lauric acid gave small amounts of lower acids in the homologous series as degradation products. Isopropyl laurate was oxidized to fatty acids from C_2 to C_{12} in about one third the quantities found from lauryl isopropyl ether.

An Improved Procedure for Preparing Glycerol Ethers. S. C. Gupta and F. A. Kummerow (Dept. of Food Technology, Univ. of Illinois, Urbana). *J. Org. Chem.* **24**, 409–11 (1959). Batyl alcohol, a natural occurring glycerol ether found in the liver of various *Elasmobranchii* (shark, rays, etc.), was found to be identical with 1-stearyl glycerol ether. The 1- and 2-stearyl glycerol ethers were synthesized with a modified procedure. Syntheses of 2-oleyl and 2-linoleyl glycerol ethers did not produce samples pure enough for accurate carbon and hydrogen values.

Syntheses of Unsaturated Fatty Aldehydes. H. K. Mangold (The Hormel Inst., Univ. of Minnesota). *J. Org. Chem.* **24**, 405–7 (1959). Oleyl-, linoleyl-, and linolenyl-aldehydes were prepared by a modified Grundmann synthesis. The procedure can be used for the preparation of radioactive aldehydes on a milligram scale.

The Preparation of Higher Fatty Aldehydes. H. P. Kaufmann and D. B. Spannuth. *Chem. Ber.* **91**, 2127–9 (1958). Esters of selenious acid and fatty alcohols yield upon pyrolysis fatty aldehydes and selenium. (*C.A.* **53**, 4118)

• Biology and Nutrition

The Experimental Production of Atherosclerosis in Swine Following the Feeding of Butter and Margarine. H. C. Rowsell, H. G. Downie, and J. F. Mustard (Ontario, Vet. Coll., Guelph). *Can. Med. Assoc. J.* **79**, 647–54 (1958). When divided into three groups, thirty-three swine, fed either a low-fat diet or isocaloric diets rich in butter or margarine, showed some atherosclerosis on low-fat diet, little increase with a high-fat margarine diet, but a considerable increase with a high-fat butter diet. Blood cholesterol and phospholipide levels did not increase with either margarine or butter diet. The evolution of the disease and the gross and microscopic findings of the atheroma resembled that found in humans. It was suggested from the data that the activity of clotting system is related to the development of atherosclerosis in the swine and that the type of fat is an important factor in dtermining these changes. (*C.A.* **53**, 4460)

Comparative Solubility of Protein in Cottonseed Flakes Extracted by Hexane and by Ethanol. L. K. Arnold and Beverly J. Schriver (Iowa Eng. Expt. Sta., Ames). *Proc. Iowa Acad. Sci.* **65**, 230–3 (1958). A higher percentage of protein in the meal extracted by ethanol than in that extracted by hexane is indicated. Apparently the ethanol extracted some nonprotein constituents not dissolved by hexane, thus resulting in a higher percentage of protein in the meal. Water-soluble protein in the hexane-extracted meal was 63.6% more than in the ethanol product. Protein in the hexane-extracted meal, soluble in sodium chloride solution, was 39.2% greater than that in the ethanol-extracted meal. Protein soluble in dilute sodium hydroxide solution in the hexane-extracted meal was 13.7% more than in that from ethanol. (*C.A.* **53**, 2498)

Debittering Soybeans in the Food Industry. G. Janíček (Vysoká škola chem. technol., Prague). *Sborník vysoké školy chem.-technol. v Praze; Oddíl potravinarské technol.* **1957**, 197–213. Debittering (deodorization) of soybeans by digestion with hot water is effective and preserves favorable organoleptic properties. Nutriments and biologically effective substances are partly removed. The increased content of water in the final product causes microbial decay. Removal of water by drying is expensive, and the soybeans darken and acquire an undesirable taste. Debittering by means of live steam is effective, no undesirable changes occur, the enzymes which may cause oxidation of the oil and carotenoids are destroyed, the biological value is unchanged, and the thermolabile protein soyin is destroyed. Debittering by infrared rays is ineffective and causes undesirable changes in the soybean fat. Biological process gives a debittered product due to the digestion by the warm water. Debittering by extracting with organic solvents is due partly to the extraction and partly to the heat during the steam-distillation of the solvents. (*C.A.* **53**, 2499)

Effect of Dietary Protein, Fat, and Choline on the Serum Lipides and Lipoproteins of the Rat. R. Olson, J. R. Jablonski, and E. Taylor (Univ. of Pittsburgh, Pittsburgh, Pa.). *Natl. Vitamin Foundation, Nutrition Symposium Ser.* **1958**(16), 22–9. Choline deficiency in the young adult rat caused a marked alteration in fat transport with a decrease in the level of cholesterol and phospholipides, a reduction in the high-density α-lipoproteins, and virtual disappearance of the low-density β-lipoproteins. The substitution of casein for soy protein entirely prevented the hypocholesterolemia and minimized the hypolipoproteinemia seen on the soy protein diets even though it did not, at all levels of dietary fat, completely prevent fatty infiltration of the liver. Apparently, for the rat, the withdrawal of choline and other labile methyl donors from the diet was a more effective means of lowering the serum cholesterol and β-lipoprotein concentration than varying the kind and amount of dietary fat. The level and type of dietary fat did not modify the effect of choline on serum lipides. The liver elaborates the β-lipoproteins which promote atherogenesis, and this process is sensitive to alteration of dietary protein, lipotropic factors, and fat. (*C.A.* **53**, 4464)

Effects of Dietary Free C_{18} Saturated and Unsaturated Fatty Acids and DL-Methionine-Choline Chloride Mixture on Plasma Cholesterol of the Male Albino Rat. E. T. Janssen (Wartburg Coll., Waverly, Iowa). *Proc. Iowa Acad. Sci.* **65**, 234–40 (1958). The feeding of 15% free acids (stearic and linoleic acid, respectively) caused a rise in the plasma cholesterol levels, the significant rise being in animals on the 15% linoleic acid diet. When a supplement of DL-methionine and choline chloride was fed, it produced a greater rise in the cholesterol levels than was produced by only the 15% linoleic acid. The liver cholesterol level showed only slight variations from the values of the control group, except in the case of the animals fed the 15% linoleic acid. The unsupplemented 15% acid diet showed a higher liver cholesterol ester content than the diet containing added methionine-choline. Indications were that on a 15% linoleic acid diet the addition of methionine-choline decreases the ester content of the liver while raising the plasma cholesterol ester content. (*C.A.* **53**, 2387)

Fat Metabolism Studies in Early Childhood. The Absorption of Fats with a High Content of Unsaturated Fatty Acids. K. Schreier (Univ. Heidelberg, Ger.) *Z. Kinderheilk.* **81**, 442–7 (1958). The absorption of vegetable fats added to cow milk, is greater than that of added butterfat. (*C.A.* **53**, 4490)

Nutritive Value of Lipides. XIII. Seborrhea Formation by Administration of Large Amounts of Esters of Fatty Acids with Higher Alcohols in Rats. 2. Preventive Methods Against Seborrhea. Takashi Kaneda, Hisae Sakai, and Seinosuke Ishii (Tokai Regional Fisheries Lab., Tokyo). *Nippon Suisangaku Kaishi* **23**, 324–30 (1957–58). Rats fed with sperm whale oil or fatty acid esters of higher alcohols such as oleyl oleate contained in the bodies 150 times as much hydrocarbon and 5 times as much sterol as did normal rats. Supplementation of the feeds by soybean phospholipide prevented the occurrence of the seborrhea but soybean and egg-yolk lecithins were not effective. Crude soybean cephalin also prevented the seborrhea although the hydrocarbon and sterol contents were still high. Ethanolamine had no preventing activity. Sitosterol prepared from the unsaponifiable matter of soybean oil rather augmented the seborrhea formation. (*C.A.* **53**, 4459)

Fat Accumulation and Storage. E. Wertheimer (Hebrew Univ., Jerusalem, Israel). *Münch. med. Wochschr.* **100**, 1153–60 (1958). The recent literature concerning the importance of adipose tissue for fat metabolism is reviewed and discussed. Thirty-three references. (*C.A.* **53**, 4498)

Diet, Blood Lipides, and Health of Italian Men in Boston. D. C. Miller, Martha F. Trulson, Mary B. McCann, P. D. White, and F. J. Stare (Harvard Univ.). *Ann. Internal Med.* **49**, 1178–1200 (1958). A study was made of 189 healthy Boston men, whose parents had been born in Naples but who had themselves lived all their adult lives in the United States. They were found to have a mean blood serum total cholesterol level and dietary fat intake similar to other Americans, but this was considered higher than that of native Neopolitans. (*C.A.* **53**, 4460)

Cholesterol Metabolism. Changes in Blood and Liver During a High-Cholesterol Diet. A. Catolla-Cavalcanti (Univ. Turin, Italy) and F. F. Ferrero. *Ormonologia* (Turin) **17**, 477–98 (1957). In albino rats fed a diet containing pork fat 40 and cholesterol 2%, a remarkable increase of cholesterol in blood and liver (but no connection between the two levels) was observed. (*C.A.* **53**, 4461)

Influence of a Fine Coconut Oil Emulsion (Ediol) on Some Blood and Tissue Constants. Experimental Research on Albino Rats. F. Grignani (Univ. Cagliari, Italy) and V. Bernardini. *Rass. med. sarda* **8**, 635–56 (1957). The presence of Ediol in the diet caused a better tolerance of the diet, avoided abnormal values for constituents of blood and tissues, and provoked an evident increase of the weight curve, especially at the lowest doses. (*C.A.* **53**, 4461)

Role of Lipides in Atherosclerosis. M. Coppo (Univ. Modena, Italy), G. P. Vechi and R. Lorenzini. *Bull. schweiz. Akad. med. Wiss.* **13**, 179–91 (1957) (in Italian). Hypercholesterolemia was observed in 60 cases of myocardial infarction. A rich diet was characteristic of this type of atherosclerosis, with 34% of the caloric equivalent coming from fats. Heparinoid substances (*N*-octylamine precipitable) in plasma appeared to be significantly lower than in the control subjects. Changes in the distribution of blood lipides and probably changes in the general lipide metabolism are involved in the pathogenesis. (*C.A.* **53**, 2430)

Lipide and Lipoprotein Relations in Serum. F. W. Fischer (Allgem. Krankenhaus, Hamburg-Barmbek, Ger.). *Klin. Wochschr.* **35**, 1112–17 (1957). A lack of dependence of lipoprotein distribution of the absolute amounts of lipide or lipoprotein in the serum of normal subjects was observed due to marked individual variations in the level of the α-lipoprotein fraction. Distribution of oil red stain on the lipoprotein fractions exhibited the strongest dependence on the distribution of cholesterol. (*C.A.* **53**, 2402)

Sites of Intestinal Fat Absorption in Dogs. D. F. Armento (Cleveland Clinic Hosp., Cleveland, O.). *Bull. Georgetown Univ. Med. Center* **11**, 158–61 (1958). Dogs were fed I^{131}-labeled triolein or oleic acid, and four to five hours later were sacrificed. Their gastrointestinal tracts were cut into 10 g. serial segments and the radioactivity of these pieces measured. The distal duodenum and the proximal jejunum were found to be the sites of maximal absorption of neutral fat, and the distal ileum for fatty acids. (*C.A.* **53**, 2405)

Conjugated Lipides. VIII. Constituents of Phrenosin. Obtained from Beef Spinal Cord. Yasuhiko Fujino (Obihiro Zootech. Coll., Obihiro, Hokkaidô). *Nippon Nôgei-kagaku Kaishi* (J. Agr. Chem. Soc. Japan) **31**, 43–5 (1957). The hydrolysate of phrenosin from beef spinal cord with H_2SO_4 in methanol contained cerebronic acid, sphingosin, and galactose. Separation and identification are described in detail. Sphingosin sulfate, m. 248–50°, triacetyl-sphingosin, m. 99–100°, tribenzoyl-sphingosin, m. 121°, and galactose methylphenylhydrazone, m. 190°, were prepared.

IX. Acid Hydrolysis of Dihydrophrenosin. *Ibid.* 46–8. The hydrolyzate of dihydrophrenosin with H_2SO_4 in methanol contained both erythro- and *threo*-types of *dihydrosphingosin*. Thus it was proved that dihydrophrenosin (erythro-type) was stereoisomerized during acid hydrolysis as was phrenosin. Tribenzoyldihydrosphingosin (erythro-type), m. 92–6°, and the same (threo-type), m. 63–5°, were prepared.

X. Alkaline Hydrolysis of Dihydrophrenosin. *Ibid.* 48–52. The hydrolyzate of dihydrophrenosin with $Ba(OH)_2$ in dioxane did not cause stereoisomerization at C 3 of sphingosin. Only about 20% of dihydrophrenosin was hydrolyzed with $Ba(OH)_2$, while 95% of phrenosin could be hydrolyzed. Infrared spectra were given for dihydropsychosin, triacetyl-dihydrosphingosin (erythro-type), and tribenzoyl-dihydrosphingosin (erythro-type).

Toxicity of Fish Oil. III. Noboru Matsuo (Tokyo Med. Coll.). *Seikagaku* (J. Japan. Biochem. Soc.) **29**, 769–72 (1957–58). Ethyl esters of highly unsaturated fatty acids from cuttle-fish oil were distilled *in vacuo*. The first distillate (the least unsaturated), boiling below 180° at 2 mm. Hg (iodine no. 232.3), was autoxidized in the air to produce oxidized ester (iodine no. 156.6, peroxide 1461 mg. %). The oxidized ester was toxic when given *per os* to albino rats at 5% to the basal diet. From this experiment it was presumed that not only highly unsaturated fatty acids but also linoleic and linolenic acids might become toxic after oxidation. Oxidized ethyl esters of highly unsaturated fatty acids (peroxide 1716 mg. %) were toxic also when applied on the skin of albino rats. Such rats died after 7–10 days. Rats died after 14–19 days which received nonoxidized esters; the esters were assumed to have been autoxidized on the skin. Oxidized esters were toxic also for rabbits.

IV. Actions of the Ethyl Esters of Highly Unsaturated Fatty Acids on Proteins and Amino Acids. *Ibid.* 773–7. Aqueous 2% egg-white solution freed from ovoglobulin produced brown curdy precipitate at 37° when added with oxidized esters of highly unsaturated fatty acids (peroxide 1800 mg. %), while it showed no change when added with nonoxidized esters. In the former case the pH of the filtrate from curdy precipitate dropped from 6.7 to 3.5 after 290 hrs., this filtrate produced no precipitate upon addition of trichloracetic acid. Thus protein was completely denatured by addition of oxidized esters. The lowering of pH was attributed to the oxidation of terminal amino acid; paper chromatography of hydroxamic acids showed the presence of formic, acetic, propionic, butyric, oxalic, malonic, oxalacetic, and adipic acids in the filtrate from the curdy precipitate. Addition of oxidized esters to glycine or glycylglycin produced brown resinous precipitate and ammonia at 37°. Oxidized esters acted on cystine to produce cysteic acid.

V. Some Considerations on the Oxidation of Highly Unsaturated Fatty Acids. *Ibid.* 807–12. Weight increase was measured of the esters of highly unsaturated acids (iodine no. 338.7) at room temp. for a year, added with nothing or 10^{-4} *M* antioxidant. As the antioxidant, hydroquinone was the most effective, ascorbic acid was medium, and α-tocopherol acetate was the least effective: α-tocopherol was slightly effective. Copper, hemin, and iron accelerated the oxidation of the esters in this order. Infrared spectra of autoxidized esters showed absorption at 3 μ due to hydroperoxide and hydroxyl groups. Ultraviolet absorption spectra showed a weak peak at 274 $m\mu$ in the esters of highly unsaturated fatty acids, boiling at 210–221° at 4 mm. Hg, and a distinct peak at 234 $m\mu$ (due to diene linkage) in oxidized esters.

VI. Toxicity of Oxidized Commercial Liver Oils. *Ibid.* 812–15. Commercial cod-liver oil (iodine no. 168.9, peroxide none) was oxidized in the air to produce oxidized cod-liver oil (iodine no. 117.8, peroxide 775 mg. %). Feeding experiments with albino rats showed sufficient growth with commercial oil and toxicity with oxidized oil. Highly unsaturated fatty acids were separated from commercial liver oil and the properties of distillate of unsaturated fatty acids were given.

VII. Production of the So-Called Seborrhea. *Ibid.* 816–18. Oleyl oleate produced seborrhea on rats fed at 15% to the basal diet. Oleyl alcohol did not produce seborrhea, but it had higher toxicity than oleyl oleate.

VIII. Toxicity of Fish Oil Polymerized by Heating in Carbon Dioxide. *Ibid.* 885–91. Feeding experiments with rats were carried out. Cuttle-fish oil at 20% to the basal diet produced normal growth. The oil heated for 120 hrs. at 95° at 20% to the basal diet produced a little worse growth. The oil heated for 10 hrs. at 250°, when fed at 20% of the basal diet, reduced the weight of rats. The same oil produced moderate growth when fed at 5% to the basal diet. By the urea adduct method the heat-polymerized oil was separated into adduct-forming ethyl esters of linear structure and non-adduct-forming esters of cyclic structure. The former produced good growth, while the latter was very toxic.

IX. Toxicity of Fish Oil Polymerized by Heating in the Air. *Eiyô to Shokuryô* (J. Japan. Soc. Food Nutrition) **10**, 255–9 (1957–58). Cuttle-fish oil was heat-polymerized at 225 ± 10° for 10 hrs. This polymerized oil contained no peroxide, but was toxic to rats when given at 20% to the basal diet owing to cyclic ethyl esters, as proved by urea adduct separation and testing.

A Simple Method for the Separation of Unsaturated Acids from Small Amounts of Lipides. F. Leupold and D. Eberhagen (Univ. Cologne, Ger.). *Fette, Seifen, Anstrichmittel* **60**, 809–11 (1958). Polyene fatty acids can be separated from saturated and weakly unsaturated fatty acids by dissolving 10–100 mg. of the mixture in a flat-bottom glass tube in 3 ml. ethyl alcohol-urea, freezing 30 minutes each at 0 and −10°, holding 3 hours at −20°, removing supernatant solution, washing the precipitate, decomposing the urea inclusion compounds in dilute hydrochloric acid, and extracting 5 times with 5 ml. ethyl ether-petroleum ether mixture. The method is applicable for the separation of fatty acids in blood serum. (*C.A.* **53**, 3738)

Essential Fatty Acids and the Problem of Atherosclerosis. L. W. Kinsell, G. D. Michaels, Priscilla Wheeler, P. F. Flynn, and G. Walker (Highland-Alameda County Hosp., Oakland, Calif.). *Am. J. Clin. Nutrition* **6**, 628–31 (1958). The lowering of plasma lipides is associated with favorable effects upon either formation of plaques or resorption of existing plaques in patients with known atherosclerosis. (*C.A.* **53**, 3438)

Transport of Fatty Acids Across the Cell Wall. J. F. Mead (Univ. of California, Los Angeles). *Am. J. Clin. Nutrition* **6**, 611–12 (1958). Experiments were carried out in the Warburg apparatus with washed cells. Substrates used were carboxy-labeled palmitic acid in buffer or its albumin complex and biosynthetic albumin from ascitic fluid of mice fed phenylalanine-3-C^{14}. When palmitic acid was added alone to the incubated cells, it was metabolized, since $C^{14}O_2$ appeared in the center cells. This oxidation was incomplete and irregular, ceasing after 30% oxidation of palmitic acid occurred. (*C.A.* **53**, 3402)

Changes in Tissue Lipides and Tissue Histology Resulting from Essential Fatty Acid Deficiency in Rats. Roslyn B. Alfin-Slater and S. Bernick (Univ. of S. California, Los Angeles). *Am. J. Clin. Nutrition* **6**, 613–24 (1958). The deficiency state was induced by withholding added fat in the diet. Animals on such a diet showed testicular degeneration and histological changes in bone. Liver sections from animals fed fat-free diets showed various degrees of fat infiltration, and this irregularly distributed. In the adrenals there was evidence of atrophy. Sections of thyroid gland gave the appearance of a hyperactive gland. (*C.A.* **53**, 3402)

Fat Absorption. J. F. Mead (Univ. of California, Los Angeles). *Am. J. Clin. Nutrition* **6**, 606–8 (1958). Absorption of hydrocarbons such as highly emulsified mineral oil and the carotenes was found to depend on simultaneous absorption of fat, the presence of bile and other factors important in absorption of fat and cholesterol. (*C.A.* **53**, 3402)

Essential Fatty Acids in Relation to Human Nutrition. A. E. Hansen (Univ. of Texas School of Med., Galveston). *Am. J. Clin. Nutrition* **6**, 625–7 (1958). A discussion of the importance of linoleic acid in the diet (*C.A.* **53**, 3402)

Lipides of Biological Importance. Peroxidation Products and Inclusion Compounds of Lipides. W. O. Lundberg (Univ. of Minnesota, Minneapolis). *Am. J. Clin. Nutrition* **6**, 601–3 (1958). A discussion of oxidation products of lipide materials, especially the peroxidation products of fatty acid esters and the so-called lipide inclusion compounds. (*C.A.* **53**, 3402)

Effect of Corn Oil on the Metabolism of Calcium and Phosphorus by Sheep. A. D. Tillman and J. R. Brethour (Univ. of Tennessee, Oak Ridge). *J. Animal Sci.* **17**, 782–6 (1958). The effects of corn oil on the utilization of calcium and phosphorus by lambs was studied by comparative balance and isotope dilution procedures. The inclusion of 7.5% dietary corn oil did not affect significantly the apparent digestibility, fecal endogenous excretion, true digestibility, or net retention of dietary phosphorus. Neither did it affect the fecal endogenous or urinary excretion of dietary calcium. This level of fat, however, significantly reduced apparent digestibility calcium from 21.6 to 11.8% and true digestibility of calcium from 62.7–54.7. (*C.A.* **53**, 3403)

Dietary Fats and Blood Coagulation. S. A. Hashim and R. E. Clancy (Harvard School of Public Health, Boston, Mass.). *New Engl. J. Med.* **259**, 1115–23 (1958). A review with eighty-five references. (*C.A.* **53**, 3406)

Effect of Pyridoxine Deficiency on Cholesterol and Polyenoic Fatty Acids in Chicks. H. Dam, G. Kristensen, G. K. Nielsen and E. Søndergaard (Polytech. Inst., Copenhagen). *Acta Physiol. Scand.* **44**, 67–69 (1958). The influence of pyridoxine deficiency on chicks fed fat-free and 10% peanut oil diets with and without 1% cholesterol was studied. Pyridoxine deficiency resulted in increased plasma and aorta cholesterol, no change in liver cholesterol, and decreased heart cholesterol. With a fat-free, pyridoxine-deficient diet a marked content of tetraenoic acid was found in heart and liver, whereas, the trienoic acid was proportionally decreased. Feeding of 10% peanut oil without pyridoxine caused less deposition of tetraenoic acid in heart and especially in liver than feeding of 10% peanut oil with pyridoxine. Addition of 1% cholesterol to the diets resulted in a decrease in amount of tetraenoic acid in heart and liver (*C.A.* **53**, 3406)

Metabolism of Plasma Unesterified Fatty Acid. D. S. Goodman and R. S. Gordon (Natl. Insts. of Health, Bethesda, Md.). *Am. J. Clin. Nutrition* **6**, 669–80 (1958). Normal unesterified fatty acid level in human beings is of the order of 0.5 meq./l., and represents a mole ratio of unesterified fatty acid to albumin of less than one. With normal lipoprotein concentrations, less than 2% of the total unesterified fatty acid is bound to low-density lipoproteins. It appears that albumin is well constructed to serve as a transport vehicle for unesterified fatty acid. (*C.A.* **53**, 3409)

Origins of Plasma Cholesterol. S. A. Byers (Mt. Zion Hosp., San Francisco, Calif.). *Am. J. Clin. Nutrition* **6**, 638–41 (1958). There is a small positive correlation between the plasma cholesterol concentration and development of clinical diseases ascribed to atherosclerosis. Cholesterol enters the plasma either by absorption or by synthesis and release from the tissues. (*C.A.* **53**, 3409)

Phospholipides and Blood Coagulation. G. Rouser (City of Hope Med. Center, Duarte, Calif.). *Am. J. Clin. Nutrition* **6**, 681–7 (1958). A significant increase in the *in vivo* coagulability of blood after a fat meal has not been demonstrated with certainty, nor has the presence of an increased amount of lipide in an available form that can promote clotting been demonstrated after fat feeding. It must be borne in mind that the methods of study are crude and that no reliable technique for the evaluation of the *in vivo* status of the coagulability of the blood is available. (*C.A.* **53**, 3409)

Determination of Unesterified Fatty Acids in Normal Human Plasma. A. Svanborg and L. Svennerholm (Univ. Göteborg, Swed.). *Clin. Chim. Acta* **3**, 443–9 (1958). A method for the determination of unesterified fatty acids in plasma is described. (*C.A.* **53**, 3414)

EFFECT OF SUPPLEMENTAL FAT ON DIGESTION AND THE RUMINAL CALCIUM REQUIREMENT OF SHEEP. T. W. White, R. B. Grainger, F. H. Baker, and J. W. Stroud (Kentucky Agr. Expt. Sta., Lexington). *J. Animal Sci.* **17**, 797–803 (1958). Three balance trials were conducted with 80-lb. crossbred wethers. Corn oil fed at 5% of the ration progressively decreased cellulose digestion during the first 40 days of trial 1. Recovery of cellulose digestion was not complete until 17 days after the omission of corn oil. In trials 2 and 3, 30 g. of alfalfa ash or 4.4 g. of calcium or 0.86 g. of phosphorus and 4.4 g. of calcium restored cellulose digestion in a ration containing 5% corn oil. The same amount of phosphorus alone or a trace mineral mixture containing Cu, Mo, Mu, Co, Fe, Zn, and B was ineffective. (*C.A.* **53**, 4452)

METABOLISM OF THE ESSENTIAL FATTY ACIDS. J. F. Mead (Univ. of California, Los Angeles). *Am. J. Clin. Nutrition* **6**, 656–61 (1958). Polyunsaturated fatty acids of the animal body are formed by successive additions of double bonds in the divinyl methane relative to the existing double bonds of unsaturated fatty acids ingested or synthesized from saturated acids in the body. The new double bonds are introduced between the existing double bonds and the carboxy groups of the acids which may be lengthened by addition of acetate when the double bond system approaches to within 3 or 4 methylenes of the carboxy group. There thus arises 3 families of polyunsaturated fatty acids, not readily interconvertible and possibly serving different functions in the body. (*C.A.* **53**, 3409)

FAT METABOLISM IN HIGHER PLANTS. XI. THE CONVERSION OF FAT INTO CARBOHYDRATE IN PEANUT AND SUNFLOWER SEEDLINGS. C. Bradbeer and P. K. Stumpf (Dept. of Agr. Biochem., Univ. of California, Berkeley, Calif.). *J. Biol. Chem.* **234**, 498–501 (1959). Carbon-14 from both acetate-1- and -2-C^{14} was rapidly incorporated into free sugars and intermediates of the tricarboxylic acid cycle by excised cotyledons from etiolated peanut and sunflower seedlings. The observed distributions of the carbon-14 within malic acid and the glucose moiety of sucrose are consistent with the operation of the glyoxylate cycle in the conversion of fat into carbohydrate in these tissues. Some of the enzymes of the glyoxylate cycle, malic synthetase, isocitritase, condensing enzyme, and fumarase, were demonstrable in soluble enzyme preparations from the peanut and sunflower cotyledons.

TOXICITY STUDIES ON THE ANTIOXIDANT 6-ETHOXY-1,2-DIHYDRO-2,2,4-TRIMETHYLQUINOLINE. R. H. Wilson and F. DeEds (Agricultural Res. Service, U. S. Department of Agriculture, Albany, Calif.). *J. Agr. and Food Chem.* **7**, 203–6 (1959). The effect on rats of the antioxidant 6-ethoxy-1,2-dihydro-2,2,4-trimethylquinoline have been investigated. The following aspects are emphasized: acute toxicity, chronic toxicity, skin toxicity, weight of vital organs, and reproductive ability.

ABSORPTION, METABOLISM, AND EXCRETION OF THE ANTIOXIDANT, 6-ETHOXY-1,2-DIHYDRO-2,2,4-TRIMETHYLQUINOLINE. R. H. Wilson, J. O. Thomas, C. R. Thompson, H. F. Launer, and G. O. Kohler (Agricultural Research Service, U. S. Department of Agriculture, Albany, Calif.). *J. Agr. and Food Chem.* **7**, 206–9 (1959). Metabolism and excretion of tagged ethoxydihydrotrimethylquinoline (EMK-C^{14}, Santoquin-C^{14}) was studied in rat and cow. EMQ is rapidly and nearly completely excreted in urine and feces. There is little breakdown to carbon dioxide, indicating stability of the ring system. Distribution in tissues suggests a modification of the molecule to make it more water-soluble. Traces of radioactivity remain in tissues for as long as 4 weeks. Continued ingestion by the rat of a diet containing 0.005% EMQ for 10 days produced tissue concentrations, as EMQ, ranging from 0.04 to 0.3 p.p.m. in muscle to 2.1 to 4.8 p.p.m. in kidney and liver. Milk from rats eating the 0.005% EMQ diet for 10 days contained 0.12 to 0.19 p.p.m. of activity as EMQ.

ESSENTIAL FATTY ACID ACTIVITIES OF HYDROCARBONS AND ALCOHOLS ANALOGOUS TO LINOLEATE AND LINOLENATE. E. Aaes-Jorgensen, O. S. Privett, and R. T. Holman (The Hormel Inst., Univ. of Minnesota, Austin). *J. Nutrition* **67**, 413-21 (1959). The effect of linoleyl and linolenyl alcohols, octadecadiene and octadecatriene upon EFA-deficient male rats has been tested. Only linoleyl alcohol relieved the symptoms of EFA deficiency. Octodecadiene and octadecatriene, hydrocarbon analogs of linoleic and linolenic acids, acted as severe skin irritants and induced fatty livers in the rats. These compounds also caused changes in the polyunsaturated fatty acid pattern of the heart lipides indicating that they absorbed and metabolized to some extent. Linoleyl and linolenyl alcohols stimulated growth and induced changes in the polyunsaturated fatty acid content of heart tissue similar to those induced by the corresponding acids.

THE SYNTHESIS AND BIOLOGICAL AVAILABILITY OF SOME LOWER HOMOLOGS OF CHOLESTEROL. E. D. Bergmann, M. Rabinovitz, and Z. H. Levinson (Dept. of Organic Chemistry, Hebrew University, Jerusalem, Israel). *J. Am. Chem. Soc.* **81**, 1239–43 (1959). Several analogs of cholesterol containing shorter side-chains have been synthesized from the chloride of 3-acetoxy-etiochol-5-enic acid (II) and di-*n*-butyl-, di-*n*-pentyl- and diphenylcadmium and from pregnenolone acetate (III) and *n*-butyl-, *n*-pentyl- and phenylmagnesium bromide. In the former case, the ketones obtained were reduced, in the latter the tertiary carbinols dehydrated and subsequently hydrogenated. The structure of these dehydration products and the configuration of the hydrogenation products has been established, the latter by the observation that the analogous series of reactions with 4-methylpentylmagnesium bromide leads to cholesteryl acetate. These "unnatural" sterols show an effectiveness of at most 43% of that of cholesterol, as growth promoters of housefly larvae. No pupation occurred when these "unnatural" sterols were added to the sterile medium in which the larvae were reared.

CHOLESTEROL BIOSYNTHESIS IN PREPARATIONS OF LIVER FROM NORMAL, FASTING, X-IRRADIATED, CHOLESTEROL-FED, TRITON, OR Δ^4-CHOLESTEN-3-ONE-TREATED RATS. Nancy Bucher, Kathleen McGarrahan, Elizabeth Gould, and A. V. Loud (Massachusetts General Hospital, Boston, Massachusetts). *J. Biol. Chem.* **234**, 262–67 (1959). The capacity to synthesize cholesterol from C^{14}-labeled acetate, mevalonic acid, and squalene has been studied in cell-free preparations of liver from rats subjected to x-rays, Triton WR 1339, food deprivation, administration of a cholesterol-rich diet, and Δ^4-cholesten-3-one. In each experimental group, large deviations from the normal level were found in all segments of the reaction sequence, but the extreme changes appearing before the point of entry of mevalonic acid far outweighed those occurring at later stages. Tissue fractionation sudies showed that the activity of the system was determined principally by the microsomes. The soluble components were also affected, but to a lesser extent.

GLYCERIDE-GLYCEROL PRECURSORS IN THE INTESTINAL MUCOSA. G. C. Buell and R. Reiser. (Dept. of Biochemistry and Nutrition, Texas Agricultural Experiment Station, College Station, Texas). *J. Biol. Chem.* **234**, 217–9 (1959). Cell-free homogenates of the intestinal mucosa of swine were incubated with palmitic acid, C^{14}-labeled fructose diphosphate, and appropriate cofactors. The label appeared in the glycerides isolated from the reaction mixture. The addition of either unlabeled dihydroxyacetone phosphate or L-α-glycerophosphate diluted the activity of the resultant glyceride, but free glycerol did not. The activity was in the mitochondria-free fraction of the homogenate. It is concluded, therefore, that the intestinal mucosa does not contain glycerol kinase, or that it is not demonstrable by the conditions used, and the L-α-glycerophosphate is the immediate precursor of glyceride-glycerol.

SOME INTERRELATIONSHIPS BETWEEN VITAMIN E AND VITAMIN A IN HOLSTEIN CALVES. Martha Dicks, J. E. Rousseau, Jr., H. D. Eaton, R. Teichman, A. P. Grifo, Jr., and H. A. Kemmerer, Jr. (Agricultural Experiment Station, Storrs, Connecticut). *J. Dairy Sci.* **42**, 501–11 (1959). Thirty-six Holstein male calves, 64 days of age and partially depleted of their tocopherol and vitamin A stores, were fed, in addition to a basal ration low in tocopherol and vitamin A, one of three levels of tocopheryl acetate, equivalent to 1, 5, or 25 mg. of free tocopherol per pound live weight per day and one of three levels of vitamin A palmitate equivalent to 10, 100 or 1000 γ of vitamin A alcohol for a 4-wk. period. Upon completion of a 28-day tocopherol-vitamin A supplementation period, one-half of the calves were slaughtered and the other 18 calves were maintained on the basal ration until plasma vitamin A decreased to 4.0 γ/100 ml. Based on plasma and liver vitamin A concentrations at the termination of supplementation and on vitamin A depletion time, tocopherol resulted in an increase in utilization of vitamin A at the highest intake of vitamin A, decreases at the lowest intake of vitamin A, and inappreciable change at the middle intake. Across all levels of tocopherol intake, the tocopherol concentration of the tissues decreased with increasing intake of vitamin A. This decrease was greater between the 10 and 100 γ intake of vitamin A than between the 100 and 1,000 γ intake. These results indicated a need to establish levels or ratios of intakes of vitamins A and E.

COUNTERCURRENT DISTRIBUTION OF MILK FAT TRIGLYCERIDES. W. Haab, L. M. Smith, and E. L. Jack (Dept. of Dairy Industry, Univ. of California, Davis). *J. Dairy Sci.* **42**, 454–67

(1959). The purpose of this study was to investigate the application of countercurrent distribution to the separation of milk fat triglycerides. Of the solvent systems tested, the most satisfactory was a 12:7:5 mixture of pentane, 2-nitropropane, and nitromethane. The distributions were followed gravimetrically and by determination of iodine values and saponification equivalents of selected fractions or groups of fractions. The fractionation was influenced by degree of unsaturation and molecular weight of the triglycerides. Although useful separations were obtained with 100 stages, better resolution was achieved by applying the technique to samples previously separated from milk fat by crystallization from pentane at low temperatures. The +4°C. precipitate and −53°C. filtrate were fractionated by countercurrent distribution, and the fatty acids in selected fractions were determined by ultraviolet spectrophotometry and gas-liquid chromatography.

Studies on the Inhibition of Growth of an Implanted Fibrosarcoma in Rats. The Effect of Fat in the Diet with and Without Injections of Guinea Pig Serum. Eloise Jameson, R. M. Ryan, and P. I. Kramer (Department of Medicine, Univ. of Southern California, Los Angeles). *J. Nutrition* **67**, 469–82 (1959). Five experiments were conducted to study the effects of inhibiting growth of an implanted fibrosarcoma in randomly bred and inbred Irish gray rats by (1) adding essential fats to otherwise ineffective diets, and by (2) giving intraperitoneal injections of guinea pig serum. Statistical analysis revealed that cottonseed oil in the diet, without guinea pig serum injections had significant effects in (1) reducing the number of tumor "takes," (2) slowing tumor growth or (3) bringing about regressions, unless the tumor was too rapidly growing to allow sufficient time for the production of possible immunologic inhibitory agents. Considering all experiments together the results were significant at the 5% level.

Relation of Natural Copper in Milk to Incidence of Spontaneous Oxidized Flavor. R. L. King and W. L. Dunkley (Dept. of Dairy Industry, Univ. of California, Davis). *J. Dairy Sci.* **42**, 420–7 (1959). Milk as it is produced by the cow contains a low but variable concentration of copper (natural copper). Results are presented that show a relatively high concentration (ca. 0.2 p.p.m.) of natural copper in early lactation milk, and a level of about 0.01–0.04 p.p.m. for most cows during the remainder of a lactation period. These results are similar to others reported recently. No difference was observed between pasture and dry feed in the natural copper concentration in the resulting milk. When cows on dry feed were drenched with large (10-g.) doses of copper sulfate, there was an increase in the natural copper content of their milk and in the incidence and intensity of spontaneous oxidized flavor. For cows on an alfalfa hay-grain concentrate ration, and not in early lactation, a highly significant correlation was observed between the concentration of natural copper in milk and the intensity of spontaneous oxidized flavor. It is concluded that the copper present in milk as it comes from the cow is an important catalyst of oxidized flavor.

The Structure of Beef Heart Plasmalogens. G. V. Marinetti, J. Ergland, and E. Stotz (Department of Biochemistry, School of Medicine, Univ. of Rochester). *J. Am. Chem. Soc.* **81**, 861–4 (1959). The total phosphatides and the lecithin and phosphatidylethanolamine fractions of beef heart were isolated and reduced with hydrogen. These lipids were degraded to give a 68–72% yield of long-chain α-glycerol ethers. Hence the major part of the plasmalogens of beef heart have the aldehyde attached to the α-position and the fatty acid attached to the β-position of glycerol. The unreduced beef heart lecithin fraction was hydrolyzed by snake venom lecithinase A to yield a mixture of the typical monoester type lysolecithin and the monoether type lysoplasmalogen. These lysophosphatides were reduced with hydrogen and hydrolyzed with acid. A 68% yield of long-chain α-glycerol ether was obtained from the lysoplasmalogen. These data demonstrate that snake venom lecithines A can hydrolyze the β-linked fatty acid on the plasmalogen. Data on the reactivity of the plasmalogens and lysoplasmalogens toward the Schiff reagent and methanolic iodine are given.

Possible Toxic Factor of Trichlorethylene-Extracted Soybean Oil Meal. L. L. McKinney, J. C. Picken, Jr., F. B. Weakley, A. C. Eldridge, R. E. Campbell, J. C. Cowan, and H. E. Biester (Northern Utilization Res. and Development Division and the Veterinary Medical Res. Inst., Iowa State College). *J. Am. Chem. Soc.* **81**, 909–15 (1959). Treatment of amino acids and peptides with trichloroethylene, under conditions known to produce the bovin aplastic anemia-causing factor in soybean oil meal and other proteins, showed that trichloroethylene reacted readily with the sulfhydryl groups of cysteine and reduced glutathione. The S-dichlorovinyl derivatives of L-cysteine and L-glutathione were synthesized and found to produce the aplastic anemia syndrome in calves typical of that produced by trichloroethylene-extracted soybean oil meal. The stability and properties of the S-dichlorovinyl derivatives are in agreement with known properties and mode of formation of the toxic principles in the meals. Enzymic hydrolysis of a toxic protein from trichloroethylene-extracted soybean oil meal resulted in the loss of a large portion of its toxicity. Chromatographic studies on the hydrolyzate indicated the presence of products resembling the synthetic compounds, and giving tests for the S-dichlorovinyl group.

The Effect of Concentrates of Polyunsaturated Acids from Tuna Oil Upon Essential Fatty Acid Deficiency. O. S. Privett, E. Aaes-Jorgensen, R. T. Holman, and W. O. Lundberg (Hormel Inst., Univ. of Minnesota, Austin). *J. Nutrition* **67**, 423–32 (1959). Highly unsaturated acids from tuna oil were concentrated and their esters were separated according to chain length by fractional distillation. Each chain-length fraction was fed as a supplement to fat-deficient rats and the effects were compared with those induced by ethyl linoleate. None of the fractions containing fatty acids of 16, 18, 20 or 22 carbon atoms in length relieved the dermal symptoms of EFA deficiency. However, all the fractions except the 16-carbon fraction showed marked stimulation of growth. Only the 16-carbon fraction allowed the deposition of abnormally high amounts of trienoic acid in heart and testis tissue.

Nutritional Studies with the Guinea Pig. V. Effects of Deficiency of Fat or Unsaturated Fatty Acids. Mary Reid and Mary Matin (Lab. of Nutrition and Endocrinology, U. S. Dept. of Health, Education, and Welfare, Bethesda, Md.). *J. Nutrition* **67**, 611–22 (1959). Purified diets containing all of the nutrients known to be required by the guinea pig except fat were fed to guinea pigs placed on the diet at two to five days of age. Comparable animals were given the same type of diet to which 7.3% of corn oil had been added. As previously found in this laboratory, lack of dietary fat caused retarded growth, dermatitis, skin ulcers, loss of fur, and some mortality.

Catabolism In Vitro of Cholesterol. I. Oxidation of the Terminal Methyl Groups of Cholesterol to Carbon Dioxide by Rat Liver Preparations. M. W. Whitehouse, E. Staple and S. Gurin (Dept. of Biochemistry, Univ. of Pennsylvania, Philadelphia, Pa.). *J. Biol. Chem.* **234**, 276–81 (1959). Rat liver mitochondria are able to oxidize the terminal methyl groups of the cholesterol side chain to carbon dioxide in the presence of a soluble cofactor prepared from either liver tissue or heart muscle. Glutathione, adenosine 5-monophosphate, adenosine 5′-triphosphate, diphosphopyridine nucleotide, magnesium ions, and sodium citrate must be added for optimal activity. Evidence is presented that this oxidation requires the functioning of the tricarboxylic acid cycle.

Examination of Lipids in Human Sebum by Disk Chromatography. J. Horacek and Marie Cernikova (Masaryk Univ., Brno, Czechoslovakia). *Biochem. J.* **71**, 417–19 (1959). Paper chromatography of lipids of sebum obtained from the forehead skin of healthy white adults showed the presence of phosphatides, triglycerides, cholesterol and its esters, and plasmalogens.

Ketosis in the Rat on a Fat Diet. P. A. Mayes (Royal Veterinary College, London, N.W. 1). *Biochem. J.* **71**, 459–66 (1959). The course of ketosis was investigated in rats fasted 24 hr. and subsequently fed various levels of butter. Ketonaemia persisted under all diets which were deficient in calories but was reduced markedly, or even abolished, when the calorie requirement was met entirely from exogenous fat. The amount of liver fat and glycogen increased in proportion to the quantity of fat fed.

Vitamin A_1 Aldehyde in the Eggs of the Herring (Clupea Harengus L.) and Other Marine Teleosts. P. A. Plack, S. K. Kon, and S. Y. Thompson (Natl. Institute for Research in Dairying, Univ. Reading). *Biochem. J.* **71**, 467–76 (1959). The biological vitamin A activity of herring eggs is about ten times greater than the chemically determined content of vitamin A_1 ester and alcohol. Most of this activity is accounted for by vitamin A_1 aldehyde. A similar distribution was found in the eggs of seven other species of marine teleost fishes.

The Fatty Acids of Phosphatidylethanolamine and Phosphatidylcholine from Hen's Egg. J. C. Hawke (Fats Research Lab., Dept. Sci. & Indus. Research, Wellington, New Zealand). *Biochem. J.* **71**, 588–92 (1959). Gas-liquid chromatography of fatty acids from phosphatidylethanolamine and phosphatidylcholine from egg yolk revealed, respectively, C_{18}

saturated 39.5 and 14.2%, and C_{18} unsaturated, 20.1 and 44.7%. Most of the unsaturated C_{18} acid in phosphatidylcholine was oleic acid. More C_{20} and C_{22} unsaturated acids were present in phosphatidylethanolamine than in phosphatidylcholine.

Growth-Promoting Activity of Butterfat Acids for Lactobacillus Casei. M. N. Camien and M. S. Dunn (Univ. California, Los Angeles). *Proc. Soc. Exptl. Biol. Med.* 100, 433–6 (1959). The *L. casei* growth-promoting factor in butter fat was shown to be myristic acid and traces of an unidentified contaminant. Purified commercial myristic acid was essentially inactive.

Phospholipids of Human Red Blood Cells. G. B. Phillips and N. S. Roome (College of Physicians and Surgeons, Columbia Univ., N. Y. City). *Proc. Soc. Exptl. Biol. Med.* 100, 489–92 (1959). Phospholipids from human red blood cells were chromatographed on silicic acid and found to consist chiefly of ethanolamine- and serine-containing phospholipids, lecithin, sphingomyelin and lysolecithin.

Effects of Diethanolamine (DEA) on Rats Fed Atherogenic Diets. T. B. Clarkson and H. B. Lofland (Bowman Gray School of Medicine, Wake Forest College). *Proc. Soc. Exptl. Biol. Med.* 100, 525–6 (1959). In rats fed hypercholesterolizing diets, DEA significantly reduced liver lipides, liver cholesterol, aortic cholesterol, and serum cholesterol when the dietary fat was hydrogenatel coconut oil. There was no effect of DEA when dietary fat was corn oil. Serum cholesterol levels were lower in the corn oil-fed group.

Effects of Dietary Fat Upon Polyunsaturated Fatty Acids of Blood in Patients with Multiple Sclerosis. B. Gerstl, W. E. Davis, Jr., J. K. Smith, E. Athineos, and G. Herold (Vet. Admin. Hosp., Oakland, and School of Medicine, Univ. Calif., San Francisco). *Proc. Soc. Exptl. Biol. Med.* 100, 534–8 (1959). Diets containing soybean oil and lecithin decreased the cholesterol/total lipid ratio in the blood of both a control group of normal individuals and a group of patients with multiple sclerosis. The polyunsaturated fatty acid (PUFA)/lipid ratio increased in both groups but the triene/PUFA ratio decreased only in the controls.

Digestibility of Corn Germ as Factor in Its Apparent Hypocholesterolemic Effects. H. A. Nash and H. Wolff (Pitman-Moore Co., Indianapolis, Ind. and A. E. Staley Mfg. Co., Decatur, Ill.). *Proc. Soc. Exptl. Biol. Med.* 100, 622–5 (1959). Digestion of whole corn germ by chicks not receiving grit is poor. This explains to a large extent the apparent effects of whole corn germ in maintaining low cholesterol levels and preventing atherosclerotic lesions.

Serum Lipid Levels in Rats Fed Vegetable Oils with and Without Cholesterol. C. R. Seskind, M. T. Schroeder, R. A. Rasmussen, and R. W. Wissler (Univ. Chicago School of Medicine, Chicago). *Proc. Soc. Exptl. Biol. Med.* 100, 631–4 (1959). Rats were tube fed diets containing one of the following fats, with or without cholesterol: soybean oil, olive oil, an olive oil-palmitic acid mixture, hydrogenated cottonseed oil. Results suggest that serum cholesterol contents are elevated by increasing saturation of the dietary fat and that dietary cholesterol augments this effect for the more saturated fats. The phospholipid/cholesterol ratio was elevated in rats receiving the most saturated fat samples.

Process of Making Germ Flakes. F. Grandel. *U.S. 2,879,167.* Cearal seed germ material, of an oil content not exceeding about 4%, is pasted in water, is spread in a thin layer and dried.

• Paints and Drying Oils

Identification of Pigments in Paint Products by Infrared Spectroscopy. T. R. Harkins, J. T. Harris, and O. D. Shreve (E. I. du Pont de Nemours & Co., Inc., Philadelphia, Pa.). *Anal. Chem.* 31, 541–5 (1959). An infrared spectroscopic method is devised for the qualitative determination of pigments in paint products. Inorganic and organic pigments are classified according to the number and shape of the absorption bands in the infrared spectrum. Chief disadvantage is that several inorganic pigments do not exhibit characteristic infrared absorption bands.

Coatings. M. H. Swann, M. L. Adams, and G. G. Esposito (Aberdeen Proving Ground, Md.). *Anal. Chem.* 31, 674–8 (1959). This biennial review covers the period from October 1956 and represents the authors' choice of the important contributions in coating analysis.

Copolymers of the Fatty Acid Ester of a Phenoxy Ethanol-Formaldehyde Condensation Product and an Ethylenic Monomer. J. E. Hanle, A. M. Tringali and H. Yuska (Interchemical Corp.). *U.S. 2,880,187.* A resin is prepared by heating, in the presence of an organic peroxide, a mixture of styrene or methyl methacrylate and a drying oil fatty acid ester of the alcohol obtained by reacting phenoxy ethanol with formaldehyde.

Can Coating Varnishes Containing Manganese Soap Drier and Steam-Cracked Distillate Resins. J. F. McKay (Esso Research & Engineering Co.). *U.S. 2,880,188.* A baked coating for a metallic surface is formed from a mixture of drying oil (tung oil, oiticica oil, fish oil, or dehydrated castor oil), another vegetable oil such as linseed, perilla or soybean oil, a manganese carboxylate soap drier and an olefin-diolefin resin obtained by heat polymerization of a steam-cracked petroleum fraction which contains piperylene.

• Detergents

Surfactants in Viscose Processing. W. J. Alexander and R. D. Kross (Rayonier, Inc., Whippany, N. J.). *Ind. Eng. Chem.* 51, 535–8 (1959). Chemical celluloses treated with selected surfactants were carried through the viscose process to show the beneficial functions surface active additives can perform in viscose processing. Important benefits are reduction in power requirement to shred alkali cellulose, improved accessibility in xanthation with a resultant higher level of viscose filterability, prevention of spinnerette encrustation, and improved fatigue life of the resultant tire cord. Surfactants tested which were effective in bring about these improvements include Igepal CO 630, Nopco 2265 and sodium oleate, showing that nonionic, cationic or anionic types may be used.

Amphoteric Surface Active Agents. D. Bass (Cyclo Chemicals Ltd., Manfield House, Strand, London WC 2, Engl.). *Mfg. Chemist* 30, 105–6 (1959). Amphoteric or ampholytic surface active agents combine anionic and cationic chemical groups and properties. Almost any anionic compound can be turned into an amphoteric by introducing an amine group into the molecule, while cationics can be converted by the introduction of an anionic group or groups in a variety of positions. The balanced amphoteric with an isoelectric point of pH 7 is the most versatile showing particular advantages in cosmetics, pharmaceuticals and metal cleaning. The preparation, properties and uses of Miranol C2M are described as being typical of the amphoterics.

Evaluating the Effectiveness of Fluorescent Whiteners and Oxidizing Bleaches on Cotton. M. S. Furry, P. L. Bensing, and J. L. Kirkley (U. S. Dept. of Agr., Washington, D. C.). *Am. Dyestuff Reptr.* 48(8), 59–73 (1959). Using reflectometers, the fluorescent and nonfluorescent whitening effects of laundering repeatedly with different fluorescent whiteners and peroxygen- and chlorine-containing bleaches were measured in a bleached cotton percale sheeting. Results were found to conform well with visual ratings of whiteness. The extent of chemical and physical damage produced in the fabric by the various washing solutions was also determined. Based on these laboratory evaluations using small samples of the unsoiled fabric washed in a Lauder-Ometer and dried on plate glass, one syndet (with whitener) and one peroxygen bleach were selected for further study. Unsoiled swatches and naturally soiled pillowcases made from the test fabric were laundered in a modified-agitator household washer and dried by four different methods. The whitening effects produced in the fabric washed in the Launder-Ometer and in the household laundering equipment were compared for similar washing solutions. Fluidity and breaking strength results indicated the amount of damage to the fabric caused by laundering and by use.

New Columnar and Mixed Bed Ion Exchange Methods for Surfactant Analysis and Purification. M. E. Ginn and C. L. Church (Monsanto Chem. Co., Dayton, Ohio). *Anal. Chem.* 31, 551–5 (1959). Analysis of mixed anionic and nonanionic detergents by sorption of the anionic portion on an ion exchange resin is described. The nonionic portion is recovered from the effluent, after which the anionic portion is eluted from the resin and recovered. This two-stage method is applicable to common anionics and nonanionics except those that are cleaved by acid or base-ester sulfates and sulfonates. A mixed-bed, batch method is given also for the rapid purification and anlysis of nonionic surfactants.

High-Expansion Foams for Controlling Experimental Coal Mine Fires. I. Hartmann, J. Nagy, R. W. Barnes, and E. M. Murphy (U. S. Bur. of Mines, Pittsburgh, Pa.). *U. S. Bur. Mines, Rept. Invest.* **5419**, 18 pp. (1958). The foam was formed by spraying a dilute solution of a foaming agent in H_2O on a lace-knitted cotton net stretched across the entire mine entry. Generally foams produced with compounds of the lauryl sulfate type had a higher stability and lower rate of liquid loss than did those produced with alkyl aryl sulfonate, amino fatty acid, amide of fatty acid, alkylated phenol, alkylated phenol ether, and alkylated ester. (*C.A.* **53**, 2626)

Investigations of Surface-Active Agents. II. Preparation and Surface Activity of the Sodium Salts of Sulfates of Monoglycerides of Synthetic Fatty Acids. Zb. Jedlinski and M. Hampel (Dept. Technol. Fats, Gdansk, Poland). *Przemysl. Chem.* **12**(35), 47–51 (1956) (English summary). C_{12-13} and C_{13-14} fractions, respectively, of synthetic fatty acids were converted into monoglycerides, sulfonated, and converted to the Na salts. The original fatty-acid fractions contained small amounts of unsaponifiable matter, carbonyl compositions, and unsaturation. The detergent products were ''built'' with Na_3PO_4 and compared with comparable commercial products. They foamed better and had washing properties equivalent to a comparable product prepared from lauric acid. (*C.A.* **53**, 5709)

Detergents and Redeposition of Soil. J. Stawitz and P. Hopfner. *Seifen-Ole-Fette-Wachse* **84**, 711–13 (1958). Redeposition of soil on cotton was studied during the wash cycle as a function of time, with and without addition of carboxymethylcellulose (I). The redeposition begins simultaneously with the removal of soil from fabric, and it continues at the same rate through rinsing. Addition of I results in a significant reduction of redeposition rate, but only after an ''inhibition period'' of approximately 15 minutes. This period is reduced by an increased amount of I. Application of I in detergent formulation is discussed. (*C.A.* **53**, 4777)

The Preparation of Sulfonaphthenic Acids and Their Use in the Making of Detergents. B. N. Tyutyunnikov and Yu. M. Volkov. *Khim. i Tekhnol. Topliv i Masel* **3**(12), 49–52 (1958). The photochemical synthesis of sulfonaphthenic acids was carried out in a laboratory train whose main feature is a reactor provided with a heating element and a source of light. SO_2 and Cl_2 enter at a rate of 0.44 l./minute and 0.40 l./minute, respectively, per kg. of hydrocarbon to provide a detention period of 3 hours at a temperature of 25°. The sulfuryl chloride conversion is 27–30%. The conditions given are optimum for minimizing the formation of disulfuryl chlorides and the substitution of Cl in the hydrocarbon ring, which makes it hydrophylic and lowers the detergency of the Na salt of the sulfonated product. Residual Cl present in the sulfonaphthenic acid can be removed by the method of Bag involving a catalytic hydrogenation at 180° and 10–12 atm. The detergency of the naphthenic sulfonate (0.2%) is 310–325, which compares favorably with other synthetics. (*C.A.* **53**, 5709)

Application of Ion Exchangers in Detergent Analysis. P. Voogt. (Unilever Research Lab., Vlaardingen, Neth.). *Rec. trav. chim.* **77**, 889–901 (1958). Procedures are described for separating mixtures of Na salts of alkylsulfuric or sulfonic acids, fatty acids, and nonionics. Three fractions strongly acidic, weakly acidic,and nonionic, respectively, are obtained by passing an EtOH solution through the acidic form of Dowex-50 (8% cross-linked), the acetate form of Dowex-1 (2% cross-linked) and the basic form of Dowex-2 (8% cross-linked). The acids are determined by potentiometric titration, and the nonionics are determined gravimetrically. (*C.A.* **53**, 5709)

Synthetic Detergent Formulations Containing N-acyl Taurates. H. Y. Lew (California Research Corp.). *U.S. 2,874,125.* The foaming and sudsing properties of synthetic detergent compositions containing water-soluble N-acyl taurates prepared from tallow, or taurate mixtures with other detergents, are improved by the addition of from about 1 to 5% of a C_{12}–C_{18} saturated straight-chain alcohol such as hexadecanol.

Sulfonate Detergent Compositions of Improved Foam Characteristics. H. Y. Lew and R. D. Stayner (California Research Corp.). *U.S. 2,874,127.* The foam of dilute aqueous solutions of branched-chain C_9–C_{15} monoalkylbenzene sulfonate detergents can be improved by combining them with from 2 to 20% by weight of a sulfonated C_{10}–C_{18} saturated fatty acid anilide such as N-acyl sulfanilate and then combining with from 2 to 20% of a saturated aliphatic alcohol or 1,2-glycol.

Detergent Compositions. P. B. Dalton (Colgate-Palmolive Co.). *U.S. 2,875,153.* It has been found that an improved detergent gel with useful properties may be formed by selecting the proportion of a water-soluble soap to liquid nonionic polyalkylene oxide detergent from the range of about 4:1 to 1:1 by weight, with total weight of the two detergents from about 40–60%, the rest being water.

Non-Caking Solid Particulate Detergents. A. H. Lewis (California Research Corp.). *U.S. 2,875,154.* Caking tendencies of detergent compositions which contain sodium salts of alkyl benzene sulfonic acids or alkyl toluene sulfonic acids having from 9 to 18 carbon atoms in the alkyl chain can be reduced or completely eliminated by adding about 3 to 5% by weight of boric acid.

Detergent Briquette and Process for the Production Thereof. G. D. Miles (Colgate-Palmolive Co.). *U.S. 2,875,155.* Particles of detergent containing hydratable inorganic salt are lightly compressed to a foam-retaining condition, and then the surfaces of the resulting briquette are moistened to hydrate the salt and increase the strength and abrasion resistance of the product.

Making Perborate Containing Detergents. B. Strain, S. L. Eaton, and K. R. Ericson (The Procter & Gamble Co.). *U.S. 2.876,200.* A granular detergent-perborate washing composition having bleaching properties is prepared in which the perborate is entrained in the porous structure and is not subject to gravitational separation during handling.

Detergent Composition. P. Feldmann (Dan River Mills Inc.). *U.S. 2,876,201.* The detergency value of ethylene oxide condensation products is improved by the addition of a base such as ammonia or an organic amide, and a builder which is the sodium salt of styrene-maleic anhydride copolymer known as Stymer S.

Clear Liquid Detergent Composition. K. C. Krumrei, Bruce Strain, and H. J. Peddicord (Procter & Gamble Co.). *U.S. 2,877,185-6.* A heavy-duty clear liquid detergent is prepared which contains an alkyl glyceryl ether sulfonate, a solubilizer such as sodium toluene sulfonate, large amounts of pyro- or tripolyphosphate and silicate of soda to protect against tarnishing or corrosion of aluminum.

Detergent Containing B,B'-Decylaminobisethanolpropionamide. L. F. Henderson and C. H. Schramm (Lever Brothers Co.). *U.S. 2,877,187.* A light-duty powdered or liquid anionic or nonionic detergent contains a small amount of B,B'-decylaminobis-ethanolpropionamide to improve the sudsing and detergency of the composition.

Detergents Containing Succinic Compounds. V. Dvorkovitz, N. W. Berst, and G. G. Leist (Diversey Corp.). *U.S. 2,878,190.* A non-acid, non-irritating detergent consists of a mixture of sodium higher alkylbenzene sulfonates and higher alkylphenyl ethers of polyethylene glycol and at least 0.1% of a skin-irritation reducing additive such as succinic acid or its salts.

Continuous Soap Manufacture. G. Mazzoni S.p.a. *Italian 550,133.* Proportional amounts of pre-heated fatty acids and alkalies are introduced in a series of reaction chambers which continuously heat and blend the reaction products under controlled pressures and temperatures. The process is automatic and provides thoroughly saponified products of a constant degree of alkalinity. (*C.A.* **53**, 4781)