GEORGIAN ROOM—Against the fireplace background are several Session A speakers Tuesday morning: Arthur Ehrlich, David A. Yeadon, Frank A. Norris, J. C. Konen, chairman, R. O. Feuge, and Lewis A. Baumann.

Memphis Program Covers Important Phases of Fats and Oils

AUTHORS from 16 states and one foreign country presented 46 papers in the technical sessions at the 49th annual meeting of the American Oil Chemists' Society held in Memphis, Tenn., April 21-23, 1958, at the Peabody hotel. The technical papers were the contributions from four universities, four government laboratories, four institutes, and 23 industrial laboratories. Almost all of the important phases of fats and oils, such as statistics, new products, metabolism, processing, analysis, and chemical reactions were included in the technical papers. Highlighting the technical program however was a symposium on the rapidly growing industry of tall oil. The technical program was excellently organized by S. J. Rini of the HumKo Company, and the six technical sessions were presided over by J. C. Konen, D. B. Zilversmit, J. P. Krumbein, J. C. Cowan, C. E. McMichael, and C. W. Glankler, respectively.

Upward Trends in the Consumption of Soybean Oil and Animal Fat

The technical sessions were opened by David Hull of the National Cotton Council of America, who pointed out that the total factory consumption of fats and oils in the United States rose from 7.4 billion pounds in 1953 to 8.4 billion pounds in 1957. Downward trends occurred in cottonseed oil and linseed oil while the consumption of soybean oil, cocoanut oil, and edible animal fats was generally upward. In 1957 0.9 billion pounds of soybean oil and 0.3 billion pounds of cottonseed oil were used in shortening. Soybean oil also accounted for 76%, or nearly 900 million pounds of total fats and oils consumption in margarine in 1957. While the usage of fats and oils in shortening turned downward from the record 1.9 billion pounds in 1955 to about 1.7 billion pounds last year, the amount of oils winterized for use in salad oil, cooking oil, and related products rose from 650 million pounds in 1953 to almost 850 million pounds in 1957.

Six hundred twenty-one samples of seeds were studied by F. R. Earle of the Northern Utilization Research and Development Division, U.S.D.A., in a comprehensive search for discovery of new or little known plant materials which might have potential industrial use but which are not now growing commercially in this country. Fatty acid compositions of 66 of the species were added to the literature. In a search for oils with high iodine value Earle and his associates screened oils from seeds of 87 little known plant species by chemical analyses and found 12 with iodine numbers ranging from 180 to 213.

Investigations on new products from known oils were also reported. T. L. Ward of the Southern Utilization Research and Development Division, U.S.D.A., prepared a number of diglyceride esters of short-chain dibasic acids. The compounds might serve as lubricants in food processing if they are shown to be without adverse physiological effect. L. E. Gast of the Northern Utilization Research and Development Division, U.S.D.A., reported a study of the esters of the Guerbet alcohols from soybean and linseed alcohols with sorbic, acrylic, maleic, and soybean fatty acids. Preliminary experiments showed that these products appear to have promise as protective coatings.

A. Ehrlich of the Baker Castor Oil Company reported the details covering the preparation of a nonshrinking, semi-rigid, light-weight urethane foam, based on an 85% low volatile castor oil with 15% epoxy castor oil. The use of castor oil in the preparation of polyurethane foams was also reported by D. A. Yeadon of the Southern Utilization Research and Development Division, U.S.D.A.

The addition of a small percentage of completely hydrogenated cottonseed oil to chocolate appears to prevent the undesirable softening of chocolate and greatly retards fat leakage at summer temperatures. W. A. Guice of the Southern Utilization Research and Development Division, U.S.D.A., reported that such additions have little or no effect on the mouthing quality but markedly increase the consistency at about 100° F. This increase is such that the fortified chocolate probably is unsuitable for use in enrobing but can be used in making molded bars.

Metabolism of Cholesterol and Fat

C. R. Treadwell of George Washington University reported that dietary cholesterol esters are probably hydrolyzed to free cholesterol in the lumen prior to passage into mucosa. In the mucosa the cholesterol is mixed with a metabolic pool of free cholesterol prior to esterification. Free cholesterol from the metabolic pool and the newly formed cholesterol esters, along with triglyceride and phospholipide, are incorporated into chylomicrons just before or during passage into the lacteals. The effects of some dietary components on cholesterol metabolism were reported by David Kritchevsky of the Wistar Institute.

D. L. McCollister of the National Heart Institute reported that fatty acids are transported as an unesterified fatty acid albumin complex. The chylomicrons are formed in the intestinal wall and constitute the primary means of transporting ingested fat. Chylomicrons enter the blood stream via the thoracic duct but are rapidly removed by the tissues. Frequent protracted elevation of *beta*-lipoproteins was observed in humans on diets containing large amounts of animal fat. However similar conditions do not raise *beta*-lipoproteins in laboratory animals.

Study of Atherosclerosis Facilitated by New Analytical Methods

Jules Hirsch reported the details of a chromatographic procedure which can be used to separate complex lipide mixtures into the following lipide classes: saturated hydrocarbons, unsaturated hydrocarbons, cholesterol esters, triglycerides, nonesterified fatty acids, cholesterol, diglycerides, monoglycerides, cephalins, lecithin, and sphingomyelin. Recoveries of lipides applied to the 18-g. column of specially prepared silicic acid are quantitative, and separations of all major lipide classes are complete. The analytical methods for sterols, phopholipides, and triglycerides in biological

DECORATIVE BACKGROUND—Tuesday afternoon's Session B speakers are shown in the Venetian room at the Peabody: *(seated, left to right)* Richard Herrlinger, R. O. Feuge, J. C. Cowan, chairman, Guenter Schramm, and V. P. Kuceski; *(standing)* Morris Mattikow, C. R. Scholfield, B. N. Stuckey, and W. E. Link.

materials were reviewed by E. Van Handel of the University of Tennessee.

A giant step forward in the separation of methyl esters of fatty acids by gas chromatography was reported by C. H. Orr of Procter and Gamble Company. When certain polyesters of dibasic acids with polyglycols, such as Resoflex, were used as partition liquids, methyl stearate, oleate, linoleate, and linolenate as well as a number of other methyl esters of important fatty acids including arachidonic, behenic, and erucic acids were completely separated. These partition liquids allow the elution of high molecular weight fatty methyl esters in about 15 min. at about 200°. Appreciable amount of interesterification between the fatty methyl esters and the polyesters used as partition medium was observed if a high temperature, such as 240°, were used.

Gas-liquid chromatography was also applied by W. E. Link of the Archer-Daniels-Midland Company to the separation of *alpha*-olefins from C8 to C22, saturated straight chain hydrocarbons from C8 to C24, and fatty nitriles from C6 to C20. The fatty alcohols made from fatty acids of hydrogenated castor oil have been successfully separated on a silicone column.

750 Million Pounds of Tall Oil Will Be Produced This Year

A total of 12 papers concerning the processing, analysis, and application of tall oil were presented. This made the American Oil Chemists' Society the happy host to a large number of paper chemists and engineers. The symposium on tall oil was well attended, and the general interest was shown by the enthusiastic questions and discussions after the presentation of each paper.

The symposium of tall oil was opened by R. H. Potts of Armour and Company with a speculative gaze into the future of tall oil. The production of tall oil has been increased from 38 million pounds in 1940 to 550 million pounds last year and may reach 750 million pounds this year. Potts reported that the potential crude tall oil production might reach 1,450 million pounds by 1970. At the present time there are 10 plants in the United States capable of fractionating 682 million pounds of tall oil annually. E. H. Sheers of the American Cyanamid Company suggested the use of the word "octadeca (sesqui)-enoic acid" to describe the tall oil fatty acid fraction. This name indicates an 18-carbon acid having 1.5 ethylenic double bonds while American tall oil fatty acid fractions can generally be considered to be 1:1 mixtures of oleic and linoleic acids. This nomenclature will greatly simplify the naming of the derivatives of the fatty acid fraction of tall oil.

Two different types of distillation plant for fractionation of tall oil were reported. F. B. White and E. O. Barnes reported on a distillation plant built by the Foster Wheeler Corporation for the Union Bag-Camp Paper Corporation under the license of Armour and Co. This plant has a capacity of 24,000 tons per year and is capable of producing fatty acids containing only 0.5% rosin and 0.6% unsaponifiables. The rosin fraction produced by this plant contains 2% maximum of free fatty acids and 2.5% unsaponifiables. The theory of nonequilibrium film fractionation with parallel differential distillation and differential

PROCESSING—Wednesday's A speakers include these: Harold C. Templeton, Edward G. Scheibel, P. H. Eaves, C. E. McMichael, chairman, H. R. Kaiser, and O. L. Brekke.

LADY PRESENT—In Room 209, Peabody hotel, Session B speakers are grouped as Journal reporter, S. S. Chang, does a little interviewing. Those seated are J. Labarrere, Audrey T. Gros, Charles W. Glankler, chairman, and Lyle E. Gast; standing are R. E. Beal, Mr. Chang, F. R. Earle, F. C. Magne, and C. D. Evans.

condensation was reported by Andrew Spence of Spence and Green Chemical Company. A plant built according to this theory with a capacity of 1,000 lbs. per hour is now in operation.

A continuous acidulation process for splitting tall oil from soap was reported by F. E. Sullivan of the DeLaval Separator Company. The spent sulfuric acid from the chlorine dioxide bleaching process can be used for acidulation in the continuous system. M. E. Hannah of the Heyden Newport Chemical Corporation reported that a series of materials with desirable properties for surface coatings was obtained by the treatment of tall oil materials with SO_2 at elevated temperatures.

The best materials to use for various types of equipment, such as pumps, valves, piping, etc., for the processing of tall oil was reported by H. C. Templeton of the Alloy Steel Products Company. His conclusions were drawn from plant corrosion tests, which are more dependable than laboratory tests. New methods of analysis for tall oil products developed during the last 10 years through collaborative work under the auspices of the A.S.T.M. in laboratories of producers and users of these products were reported by Richard Herrlinger of the Arizona Chemical Company.

The film properties of alkyds prepared from mixtures of tall oil acids with commercially available, drying type of fatty acids by conventional and high polymer technique were reported by W. M. Kraft of Heyden Newport Chemical Corporation. He also presented a paper in which preparative details of conventional and high polymer tall oil fatty acid trimethylolethane resins are given. Alkyds modified with styrene, methyl methacrylate, and urea, and melamine resins, respectively, were discussed. Isophthalic alkyds made with tall oil fatty acids were reported to have excellent properties by R. Burkel of the Oronite Chemical Company.

One million pounds of a lanolin-type of material were recovered last year from the residue portion during the distillation of crude tall oil by the West Virginia Pulp and Paper Company, according to M. G. Bestul. The material is an ester, of which 45% represents unsaturated 18 carbon length fatty acids and 55% represents high molecular weight alcohols. The alcohol portion contains about 45% *beta*-sitosterol, 25% ligroceryl alcohol, and an unidentified remainder. This product can be used as a substitute for wool grease or lanolin type of materials as well as a rich source of plant sterols.

Valuable Organic Materials Are Recovered During Vegetable Oil Deodorization

The A. E. Staley Manufacturing Company has installed a Croll-Reynolds "Convactor" vapor scrubber condenser for removing essentially all of the condensable organic material from the deodorizer effluent vapors prior to condensation in the barometric condenser. The condensed organic material, which accumulates in the "Convactor" as an aqueous emulsion, is broken by heat into two liquid phases, and the

TALL OIL—Symposium speakers are shown in a happy mood at session-end: *(seated)* Remy Burkel, E. H. Sheers, J. P. Krumbein, chairman, Ellis O. Barnes, and Wade M. Sale Jr.; *(standing)* W. M. Kraft, Benjamin D. Berkman, M. L. Sheely, R. H. Potts, F. B. White, Manton G. Bestul, and Harold Templeton.

TALL OIL SYMPOSIUM—Part of the audience on the afternoon of April 22 at the Memphis meeting was induced to remain for a picture so that the interest in this portion of the technical program could be documented. At the rostrum is J. P. Krumbein, Newport Industries Company, Pensacola, Fla., who served as chairman.

Ross-Conroy Studio, Memphis

organic phase is separated continuously by centrifugation. R. J. Fiala of Staley reported that the organic materials recovered from deodorization of soybean oil contained 55-65% free fatty acids, 10-15% neutral oil, 12-16% sterols, and 2-5% tocopherols. This recovery system, besides greatly reducing the loss of organic material and number of pollution problems, has proven to be an economical operation.

Sullivan of DeLaval reported a new process for rendering animal fat by employing low temperature and short contact. This system gives an extremely high yield of quality fat and at the same time produces cracklings of low fat content. A flash desolventizing process for soybean protein flakes was reported by D. L. Brekke of Northern Utilization Research and Development Division. The solvent is quickly vaporized in a stream of superheated vapors, and the solids are then rapidly cooled after retention for only a few seconds in the desolventizing zone. High-quality soybean protein flakes were produced in a pilot-plant operation from hexane-extracted flakes by this flash process. P. H. Eaves of the Southern Utilization Research and Development Division reported that the conversion of from 85-96% of the fatty acids of acidulated cottonseed oil soapstocks to their methyl esters was accomplished by reacting acidulated soap-stocks directly with methanol at elevated temperatures and pressures in the presence of acidic catalysts. The present methods for controlling vegetable oil refining operations were reviewed by A. M. Gavin of Podbielniak Inc. The use of pneumatic controls and the operation of a soybean oil refinery designed for automatic control were discussed.

F. A. Norris of Swift and Company reported that the moisture content of stored cottonseed depends on the relative humidity of the air with which it is in contact. Therefore cooling the seed with moist air may have the adverse effect of increasing the moisture content of the seed. Cottonseed can be dried satisfactorily with dry air at ambient temperature or by hot undried air. In either case the economics are not favorable unless a relatively large amount of seed must be dried every season.

Sampling, Evaluation, and Analysis

Six papers reported in the technical sessions were in this category. A continuous flow sampler was designed and tested on 50% protein soybean oil meal by V. B. Shelburne of Spencer Kellogg and Sons Inc. in an effort to avoid the operational errors introduced by the human factor in taking official probe samples. This continuous-flow sampler was found to be both practical and reliable. A preliminary report on the evaluation and economic aspects of the storage of refined cottonseed oils was made by L. A. Baumann of the United States Department of Agriculture. In an effort to develop standard methods for evaluating oxidative stability of fats and fatty foods by the oxygen bomb method, B. N. Stuckey of Eastman Chemical Products Inc. expanded the surface area of the fat or oil in the bomb. He reported that a shorter test period and a possible improvement in the precision of the test method were achieved.

G. Paparielio of the C. P. Hall Company used silica gel as the stationary phase and a solvent system of increasing polarity as the mobile phase to separate the esters mixtures of polyhydric alcohols. This absorption chromatographic method can be used for quantitative determination of mono-, di-, and tri-glycerides and the mono- and di- fatty esters of ethylene glycol and polyethylene glycol. S. M. Edmonds of Refining Unincorporated developed a method for the determination of sodium soap in refined oils, using the flame photometer. Guenter Schramm of the Buckeye Cellulose Corporation reported a colorimetric method for the determination of the urease activity in soybean meals.

Autoxidation of Fats

J. Labarrere of the University of Minnesota reported on a study of the autoxidation of fats in aqueous emulsions. It has been found that the rate of autoxidation of the fat is mainly influenced by the presence of traces of metals. Amino acid inhibits the pro-oxygenic aspect of cupric copper by complex formation. The destruction of tocopherols during autoxidation of fats was reported by C. D. Evans of the Northern Utilization Research and Development Division. The presence of metallic contaminants, including residual hydrogenation catalyst, increased appreciably the destruction of tocopherol with a consequent reduction in oxidative stability. The effect of residual nickel catalyst in soybean oil and hydrogenated oil was eliminated by the addition of 0.01% citric acid.

E. G. Scheibel of the York Process Equipment Corporation reported a process for the removal of unsaponifiable impurities from the palmitic acid fraction obtained by the fractional distillation of tall oil. Purified palmitic acid was obtained by countercurrent liquid extraction, using heptane and a methyl cellosolve solution containing 10% of water as solvents. A laboratory process for the isolation of highly purified palmitic acid was also reported by F. C. Magne of the Southern Utilization Research and Development Division. Pure palmitic acid was obtained from cottonseed fatty acids through the recrystallization of its cyclohexylamine salt from acetone and the subsequent regeneration of the acid. The by-product, predominantly cyclohexylamine salts of the unsaturated fatty acids, when modified and converted to morpholides, has shown promise as plasticizers.

E. R. Cousins of the Southern Utilization Research and Development Division reported that, in hydrogenating ethyl linoleate to an iodine value of 80 with nickel as the catalyst, the concentration of double bonds was greatest at the 10 position. As the catalyst concentration and the degree of agitation increased, the proportion of double bonds at the 10 position increased. However, at the low temperature of 110° C., the concentrations of double bonds were highest at the 9 and 12 positions. The distribution of the double bonds, when palladium catalyst was used at room temperature, tended to follow the pattern obtained with nickel catalyst at high temperatures. C. R. Scholfield of the Northern Utilization Research and Development Division concluded that the glyceride composition of safflower oil follows a random pattern. The glycerides are apparently separated by countercurrent distribution in an automatic 200-tube instrument on the basis of both unsaturation and chain

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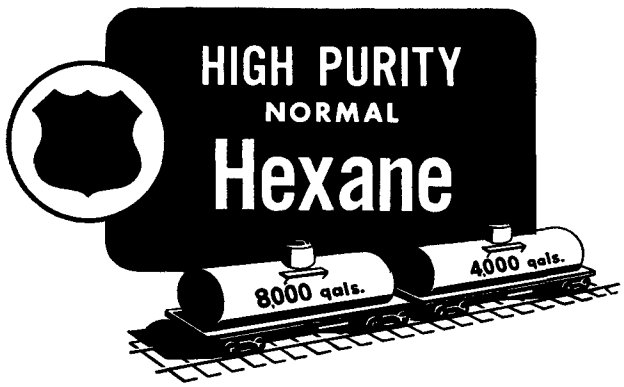

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EDIBLE FATS—Around the projector are Jules Hirsch, Duncan L. McCollester, C. R. Treadwell, C. H. Orr, E. Van Handel, David Kritchevsky, and the chairman, D. B. Zilversmit.

length of constituent fatty acid. Therefore the palmitoglycerides possess approximately the solubility characteristics of oleo-glycerides. Confirmation of this indication was obtained by countercurrent distribution of randomized safflower oil in which C^{14} labeled palmitic acid was interesterified.

S. S. CHANG
A. E. Staley Manufacturing Company
Decatur, Ill.

Memphis Meeting Breaks Record With 601 Present

THE HIGHEST record for attendance at any annual meeting of the American Oil Chemists' Society was set by the 49th in Memphis April 21-23, 1958, at the Peabody hotel, with Allen Smith, Perkins Oil Company, as general chairman. Registration totalled 601, including 113 ladies, several students, two staff members, and the advertising representative and his wife. In addition to Canada, Mexico, Brazil, and the Bahamas 30 states and the District of Columbia were represented. One of the largest groups of visitors was present for the tall oil symposium.

The business session on Monday morning was devoted to annual reports and the presidential address, most of which will be published in the Journal. Invocation was given by Rev. M. R. MacDonald of Grace-St. Luke's Episcopal church, and the welcome by Mayor Edmund Orgill, who said that for Memphis to prosper the trading area must be prosperous.

In his remarks Mr. Smith said that the initial steps to organize the American Oil Chemists' Society were taken in Memphis 49 years ago, on May 20, 1909. Nine chemists were present, three of whom are living today. Of the three, one is present, T. C. Law. He then presented Mr. Law.

It was recalled by others during the meeting that Memphis had contributed several early presidents: G. W. Agee and E. R. Barrow, both charter members, and C. H. Cox. A. E. Bailey, also a president, lived in Memphis for a time.

Monday afternoon was given over to the traditional golf tournament, which was held at the Chickasaw Country club with R. T. Doughtie Jr. as chairman.

At the close of the technical sessions Wednesday morning the annual Awards luncheon was held for the presentation of the golf and Smalley prizes. Then there was another business session, devoted to the report of the Uniform Methods Committee, of which J. T. R. Andrews is chairman, and to the installation of officers.

The Governing Board met twice: on Sunday with H. C. Black presiding and on Wednesday afternoon with J. C. Konen presiding. Many committees met, and there were two plant trips, to the Buckeye Cellulose Corporation and the Firestone Tire and Rubber Company.

Social events were highly successful and well attended. The Sunday evening mixer at the Tennessee club was given by the Woodson-Tenent Laboratories. Monday the HumKo Company was host at the cocktail party in the