would be occupied by the processing plant in which the culture medium is handled and the crop of Chlorella harvested and dried.

The ideal geographical location for a Chlorella factory-farm would be in a region where there is a high percentage of clear days, on land which is not valuable for other purposes, and in a place where adequate supplies of water, carbon dioxide, and fixed nitrogen are available. It should be borne in mind that even should high capital investment and labor costs make the process uneconomical in this country, it might still be a success in parts of the world where it is most needed, in those areas of cheap labor where the spectre of famine is ever present.

The Stanford Research Institute under a grant from the Research Corporation has made an engineering study of the possibilities in large scale culture of Chlorella (4). They considered plant designs best fitted to meet the biological requirements of Chlorella which have been outlined here, and they also made estimates of the cost of producing Chlorella on a tonnage basis. These studies need to be continued on a larger scale. Several agencies in Europe and in this country are interested in continuing work along these lines. The commercial production of oils and proteins from Chlorella may not take place in the immediate future, but the possibility of its eventual accomplishment cannot be disregarded.

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ABSTRACTS . . . . Don Whyte, Editor

• Oils and Fats

R. A. Reiners, Abstractor

The occurrence of highly unsaturated C_{20} and C_{22} fatty acids in plant phosphatides. E. Klenk and Hildegard Debuch (Univ. Cologne, Ger.). *Z. physiol. Chem.* **286**, 33-7(1950). Phosphatides from soybeans and rape seeds were precipitated from concentrated ether solution by acetone, refluxed 1 hr. with 4% HCl in methanol and the methyl esters of the unsaturated fatty esters extracted with petroleum ether. From the higher-boiling fractions (distilled in vacuo) C_{20} and C_{22} unsaturated acids were isolated. (*Chem. Abs.* **45**, 4311)

Reactions of tertiary butyl hypochlorite with vegetable oils and their derivatives. IV. Conversion of alkyl oleates and methyl linoleate to derivatives of ketostearic acids. H. M. Teeter, L. E. Gast, Dolores Raleigh and L. C. Woods (Northern Reg. Res. Lab., Peoria, Ill.). *J. Am. Chem. Soc.* **73**, 2302(1951). Alkyl oleates are reacted with t-butyl hypochlorite in the presence of an alcohol to form alkyl alkoxychlorostearates. These compounds may be decomposed at 285° and 100 mm. pressure to form a mixture of alkyl 9-ketostearate and alkyl 10-ketostearate in 70% yield.

Texas plant marks new trend in oilseed processing. Anon. *Am. Miller & Processor* **79**(5), 26(1951). A new plant in Sherman, Texas, is described in which the oil seeds are pre-expelled prior to solvent extraction.

Spontaneous heating and ignition in stored palm kernels. VI. Summary and conclusions. J. H. Burgoyne (Imperial College, London). *J. Sci. Food Agr.* **2**, 157(1951). Spontaneous heating of jute and palm kernels due to microbiological activity does occur. It can be minimized by excluding water from the stacks.

Sell that oil in citrus seed. E. E. Wright. *Food Eng.* **23**(5), 102(1951). Recovery of oil from citrus seeds will not be economically advantageous unless the oil can be sold for about 25c a pound.

The saponification of α-monomyristin, α-monostearin and α-mono-olein. H. H. G. Jellinek and A. Gordon (Lyons Labs., London). *J. Appl. Chem.* **1**, 185(1951). The saponification of α-monomyristin, α-monostearin and α-mono-olein in 75% aqueous alkaline acetone was found to be a second-order reaction. Energies of activation of the three monoglycerides were 8,900, 11,100 and 10,800 g-cal., respectively.

The component acids and glycerides of Pentaclethra (leguminosae) and Lophira (ochnaceae) seed fats. T. P. Hilditch, M. L. Meara and C. B. Patel (Univ., Liverpool). *J. Sci. Food Agr.* **2**, 142(1951). The seed fats of these West African species of plants contain 10-20% of saturated acids (mainly behenic and lignoceric) of higher molecular weight than stearic acid. The unsaturated acids are confined to oleic and linoleic in varying proportions. The composition of the mixed glycerides in the fats conforms closely to even distribution.

The seed fat of Parinarium laurinum. Part II. Component glycerides of the seed fat. J. P. Riley (Univ. Liverpool). *J. Chem. Soc.* **1951**, 291. The component acids of the fat of *P. laurinum* are parinaric 55.8%, elaeostearic 27.0%, conjugated dienoic 1.3%, linoleic 2.2%, oleic 7.6%, and saturated 6.1%. The principal glycerides are triparinarin 22%, elaeostearo-diparinarin 27%, oleo-elaeostearo-parinarin 16%, saturated-elaeostearo-parinarin 15% and dielaeostearo-parinarin 7%. The component acids, except parinaric, appear to be combined in the glycerides according to the rule of even distribution. In the case of parinaric acid, however, far more triparinarin is present than would be accounted for by either even or random distribution principles.

Analysis of fat acid oxidation product by countercurrent distribution methods. Model compounds. K. T. Zilch and H. J. Dutton (Northern Reg. Res. Lab., Peoria, Ill.). *Anal. Chem.* 23, 775(1951). The distribution in the Craig countercurrent apparatus between hexane and 80% ethanol was studied for a series of compounds similar to those which might be produced on oxidation of fatty acids. Their weight distribution curves were predictable from their partition coefficient and the binomial theorem.

Chromatographic separation of choline-containing phospholipids from phospholipid mixtures. T. H. Bevan, G. I. Gregory, T. Malkin and A. G. Poole (Univ., Bristol, England). *J. Chem. Soc.* **1951**, 841. Choline containing phospholipids (lecithin and sphingomyelin) may be separated from other phospholipids using a column of powdered cellulose.

Formation of cyclic compounds in polymerization of methyl esters of fatty acids from linseed oil. H. I. Waterman, C. J. Kips and J. van Steenis (Tech. Univ., Delft, Holland). *Research* **4**, 96(1951). Polymerization of the methyl esters of linseed oil fatty acids at 300-310° in the presence of SO_2 yields a monomer and polymer fraction which contain rings. Ring analysis was performed by direct catalytic high pressure hydrogenation at 300°. The monomer fraction contained 0.3 ring per molecule, the polymer fraction about 2.

Utilization of olive-oil foots. J. M. M. Moreno. *Ion* **10**, 579-85(1950). Extraction of olive-oil press cake with CS_2 produces a low-acidity (8-10% free fatty acid) and high-acidity oil, and cake which can be used for fuel, destructively distilled to pyroligneous acid, or hydrolyzed to furfural. Low-acidity oils can be blended with olive oil, or hydrogenated (after S removal), and trans-esterified to give margarine and shortenings. High-acidity oil is produced in the greatest amount and is the least valuable. Oils containing more than 50% free fatty acid are used in soap manufacture without glycerol recovery; those containing less are first hydrolyzed in the Twitchell process. Hydrogenation of high-acidity oils is possible after removal of S and oxidation products, but color bodies lower the activity of the catalyst and color remains after hydrogenation. (*Chem. Abs.* **45**, 4468)

Analysis of refining foots. J. P. Wolff. *Oleagineux* **5**, 646-9 (1950). The following new gravimetric method is simple, short (about 2 hrs.), and accurate to 0.5%. It depends on the acid decomposition of the neutralization pastes, which results in the simultaneous formation of emulsions and hydrolysis of the neutral oil. Dissolve 8 to 10 g. of the paste in 75 cc. of a 2:1 dioxane-water mixture, with heat. Add 5 to 10 drops of 0.2% bromocresol green and titrate with *N* HCl to a yellow color. Extract the resulting acid-oil with three 25-cc. portions of ethyl ether. Unite the extracts, dry on a water bath to a constant weight, and weigh. One cc. of *N* HCl corresponds to 40 mg. of combined NaOH. This is the determination for total, i.e., sum of fatty acids and neutral fat. To determine the percentage of neutral oil, dissolve 5 g. of the paste in a 1:1 dioxane-water mixture. Neutralize with NaOH and phenolphthalein. Extract at 50 or 60° with four 25-cc. portions of hexane or petroleum ether. Unite the extracts, wash with 3 warm and 1 cold 25-cc. portions of 1:1 dioxane-water mixture. Dry on a water bath to a constant weight. and weigh. If the resulting oil is a gel because of traces of soap, use a volumetric method of measurement. (*Chem. Abs.* **45**, 4468)

Chromatography of carotene from palm oil. I. Low and S. Argoud. *Oleagineux* **5**, 629-33(1950). Concentrated carotene extracts of palm oil were prepared by distillation and by saponification procedures. When the extracts were dissolved in petroleum ether and passed through a column of MgO, 3 carotene isomers (α, β, and γ) and lycopene were found, β-carotene predominating. During the course of treatment, steroisomers were formed, particularly di-cis-carotene, which is often misnamed pseudo-α-carotene. Isomerization is reversible, the trans form being the more stable. The isomerization explains many divergences and variation, but can be diminished by taking precautions during extraction, such as avoiding high temperatures. (*Chem. Abs.* **45**, 4467)

Rapid titration in the potassium periodate glycerol procedure. R. Colson. *Oleagineux* **5**, 701-4(1950). This new method depends on the immediate oxidation of glycerol by K periodate. Weigh 0.2 g. of concentrated glycerol, add 200 cc. water and 2 drops of bromocresol purple. Adjust the color to blue with 0.1 *N* NaOH or HCl. Add 1.4 g. K periodate and put the mixture at 37-40° with occasional shaking. Then add 3 cc. of propylene glycol, mix, and titrate with 0.1 *N* NaOH to a blue color. Since 1 cc. of 0.1 *N* NaOH equals 9.2 mg. glycerol, the percentage of glycerol in the sample is the weight of the sample in g. divided into 9.2 × vol. NaOH × normality of the NaOH. The method is simple, rapid, and accurate to 0.4%. (*Chem. Abs.* **45**, 4467)

Peroxide test method for determining oil and fat stability. M. J. Golden (McKesson & Robbins, Inc., Bridgeport, Conn.). *J. Am. Pharm. Assoc.* **40**, 119-22(1951) . The use of $Fe(CNS)_2$ as in the peroxide test on mineral oil is recommended for the determination of stability in fats and oils and is simple, accurate, and reproducible. By carrying out the test at 125°, it takes 75-90% less time than the Swift active O method. (*Chem. Abs.* **45**, 4467)

The component acids and glycerides of a horse mesenteric fat. S. S. Gupta and T. P. Hilditch (Univ., Liverpool). *Biochem. J.* **48**, 137(1951). The component acids of mesenteric fat from a horse consisted of oleic (34%), palmitic (26%), linolenic (16%), lauric (0.4%), myristic (4.5%), stearic (4.7%), linoleic (5.2%), unsaturated C_{16} (6.8%), unsaturated C_{20-22} (2.3%), and arachidic (0.2%). The composition of the glycerides follows the principle of even distribution.

Solvent extraction of vegetable oil. A. J. Falkenberg (Am. Mineral Spirits Co.). *Soybean Digest* 11(7), 22(1951). A review emphasizing the increasing importance of solvent extraction in oil recovery.

Fat content of the muscles of some Bombay marine fishes. R. S. Patakoot, L. B. Pradhan and N. N. Murti (Ramarain Ruia Coll., Bombay). *J. Univ. Bombay* 18, Sci. No. 27, 3-6 (1950). The fat extracted by ethyl ether from the muscles of 32 species collected from Aug. to Sept. was 0.300-1.989%. (*Chem. Abs.* **45**, 4362)

The determination of fat in sweetened foods. R. H. Morgan and H. W. Rawlings (Croft House Lab., Finchley, England). *Analyst* **76**, 161(1951). The method of Nicholls *et al.* was modified by carrying out the hydrochloric acid digestion at 50° rather than 80°. This permitted easier extraction of the fatty acids and reduced troublesome charring.

9,11-octadecadienoic acid and 13,15-docosadienoic acid from simple unsaturated fatty acids. H. Schmid and A. Lehmann (Univ. Zurich, Switz.). *Helv. Chim. Acta* **33**, 1494-1503(1950). A method of synthesizing 9,11-octadecadienoic acid is described in which the methyl ester of elaidic acid is brominated on the 11th carbon atom using succinobromimide, and then HBr is removed by treatment with collidine at 130° under nitrogen. A similar method is used for the synthesis of 13,15-docosadienoic acid from *trans*-13-docosaenoic acid.

A total synthesis of linoleic acid. H. M. Walborsky, R. H. Davis and D. R. Howton (Univ. California at Los Angeles). *J. Am. Chem. Soc.* **73**, 2590(1951). A six-step process is described starting with 1,9-decadiyne to yield 9,12-octadecadiynoic acid which on hydrogenation gives a product containing linoleic acid. Preparation of linoleic acid in this manner provides chemical evidence substantiating its *cis, cis* configuration.

A study of n-octadecenoic acids. II. Diffusion patterns of trans-6-through 12-octadecenoic acids. E. S. Lutton and D. G. Kolp (Procter & Gamble Co.). *J. Am. Chem. Soc.* **73**, 2733 (1951). An x-ray diffraction study of trans-6- through 12-octadecenoic acids reveals an alternation of pattern corresponding to the melting point alternation. Those compounds whose double bond begins at an odd-numbered carbon have greater long spacings and lower melting points. Short spacing data of the several acids within each series, odd or even, are quite similar, but detailed observation reveals definite differences which are sufficient to help in identifying an individual pure acid.

The seed oil of Onguekoa gore Engler. Part I. The position of the hydroxyl group in the unsaturated monohydroxy-C_{18} acid (or acids). J. P. Riley (Univ., Liverpool). *J. Chem. Soc.* **1951**, 1346. The seed fat of *Onguekoa gore* Engler (an equatorial African tree) has been found to contain at least one C_{18} unsaturated acid with a hydroxy group on the eighth Carbon atom.

The unsaponifiable matter in butter fat. Isobel M. Morice (Dept. Sci. Ind. Res., Wellington, New Zealand). *J. Chem. Soc.* **1951**, 1200. Chromatographic analysis has shown the unsaponifiable matter in butter fat to be extremely complex. Lanosterol has been isolated. Four, as yet unidentified compounds, have also been isolated.

Solvent extraction saves dollars. J. L. Carlson. Food Eng. 23(6), 102(1951). Trichlorethylene batchwise solvent extraction of dry rendered cracklings has improved the grease yield.

New method of identifying peanut oil in its mixtures with olive oil. P. B. *Cahiers coloniaux* **1949**, 244-5. The temperature at which turbidity occurs when slowly cooling a mixture of fatty acids and water is called the turbidity point (I). Another value (II) is obtained when 1 ml. fatty acids in 25 ml. ethanol is cooled from 70°. The ratio of these values (I/II) in degrees C. is characteristic for fatty acids of various oils. For coconut oil the ratio is in the range 2.45-2.60, olive oil 1.92-2.40, linseed oil 1.77-1.85, and for peanut oil 0.81-0.85. Olive-oil acids with a ratio less than 1.9 contain a proportionate amount of peanut oil. (*Chem. Abs.* **45**, 3618)

Agricultural notes on two little known oleaginous plants: safflower and cress. R. Favilli. *Olearia* **5**, 83-89(1951). Discusses the conditions necessary for satisfactory growth and oil production from these two plants, the safflower (*Carthamus tinctorius* L.) and cress (*Lepidium sativum* L.).

The refining of vegetable oils and their preliminary treatment. A. Paleni. *Olearia* **5**, 75-81(1951). The older methods of long decanting for separation of a clarified oil have been replaced by acid hydrolysis, washing with water, saline-alkaline washing, desulfurizing, delecithinization, precipitation of fractions by changing the solvent, absorption by contact or percolation either alone or in combination with solvents.

Deacidification of vegetable oils by extraction with binary solvents. A. Rius and M. A. Crespi. *Anales de Fis. y Quim. (Madrid).* **47B**, 243-256(1951). Solubility and phase equilibrium data were studied for grapeseed oil, total fatty acids, methanol, and similarly for walnut oil. Vegetable oils can be deacidified using methanol and the corresponding diagram is plotted.

Apparatus for stabilizing the degree of decolorization of oils. T. L. Pepe. *Olearia* **5**, 92(1951). A simple mechanical device is described for attachment to the oil bleacher in order to ascertain rapidly the degree of decolorization of oils extracted by carbon disulfide.

PATENTS

Apparatus for solvent extraction of oil from seeds. H. R. Straight. *U. S. 2,550,947.* Improved apparatus is described for extraction of oil seeds in a Bonotto-type extractor.

Solvent extractor. L. F. Langhurst (V. D. Anderson Co.). *U. S. 2,554,109.* A horizontal extractor is described for removing oil from oil bearing materials.

Fully cured olive brine treated food glyceride oils and method of producing same. S. Musher (Musher Foundation, Inc.). *U. S. 2,554,870.* A method is described of making an oil having an intensified olive flavor which comprises curing ripe olives in brine for a period of at least 6 months, separating the brine from the olives, mixing the brine and the oil and then separating the oil from the brine.

Salad oils and method of producing same. S. Musher (Musher Foundation, Inc.). *U. S. 2,554,872.* A method of making olive oil having a new and intensified flavor is described which comprises aging and fermenting ripe olives in a 5-13% common salt solution for at least 6 months, grinding the olives, expressing the oil from the olives, and separating the oil from the brine.

Continuous bleaching process. J. H. Sanders (Procter & Gamble Co.). *U. S. 2,555,098.* Water washed caustic refined glyceride oil containing dissolved and entrained moisture is contacted with bleaching clay for at least one minute to cause color removal by the clay. The removal of the moisture contained in the oil-clay mixture is delayed until effective color absorption has occurred and then the moisture is removed by vacuum drying.

Fatty food compositions and method of making same. H. H. Bogin and R. D. Feick (Parke, Davis & Co.). *U. S. 2,555,467.* A dry, stable, non-toxic, greaseless solid fat food product is described which consists of a mixture of a normally greasy food and methyl cellulose and an alkali metal salt of carboxymethyl cellulose.

Fatty food compositions and method of making same. H. H. Bogin and R. D. Feick (Parke, Davis & Co.). *U. S. 2,555,468.* A dry, stable, non-toxic greaseless solid fat food product is described which consists of a mixture of a greasy food and polyvinyl alcohol.

Oil produced from eggs. W. B. Cooper. *U. S. 2,555,731.* A method of producing oil from fowls' eggs is disclosed which comprises hard boiling the eggs, removing the yolks from the eggs and reducing the yolks to an oily liquid by heating in the presence of a liquid starting and accelerating agent.

Preparation of phosphatides. S. A. Karjala and F. W. Riley (Central Soya Co., Inc.). *U. S. 2,555,972.* A new composition of matter is disclosed which consists of 50-60% phosphatides, a vegetable oil and 1-6% of propylene glycol. This composition is stable toward oil separation and has a low viscosity at room temperature.

Deodorization of fish oil. R. Sasaki. *Japanese 176,743.* One kg. of fish oil is heated at 100° for 3 hrs. while air is passed in and 9 g. 50% H_2SO_4 in 3 portions or 10 ml. 5% $KMnO_4$ is added and then it is washed with 500 ml. water, in 2 portions. Then NaOH to pH 4.8, and 10 ml. of a saturated solution of $NaHCO_3$ are added. The mixture is stirred for 2 hrs., washed with water, then treated with acid clay or decolorizing C. (*Chem. Abs.* **45**, 4470)

• Biology and Nutrition

R. A. Reiners, Abstractor

The utility of synthetic fatty acid amides as fodder. F. Just and G. Walther (Humboldt Univ., Berlin). *Chem. Tech.* (Berlin) **2**, 332-5(1950). Tests on rats indicate that fodder enriched with laurie acid amide causes a greater weight gain over a 30-day period than equal amounts of fodder enriched with olive oil. A mixture of the amides of acids produced by oxidation of mixed paraffins gave a slightly lower weight gain than did olive oil when used as an adjunct to the basic food. (*Chem. Abs.* **45**, 4373)

Effect of heated linseed oil on reproduction and lactation in the rat. Florence A. Farmer, E. W. Crampton and Margaret I. Siddall (McGill Univ., Quebec). *Science* **113**, 408(1951). Linseed oil heated at 275° for 4 hours in the absence of oxygen was found to be less nutritious than unheated oil. Diets containing 10% of the heated oil impaired reproduction and lactation in female rats.

Studies to determine the nature of the damage to nutritive value of some vegetable oils from heat polymerization. I. The relation of autoxidation to decrease in the nutritional value of heated linseed oil. E. W. Crampton, R. H. Common, Florence A. Farmer, F. M. Berryhill and L. Wiseblatt (McGill Univ., Quebec, Canada). *J. Nutrition* **43**, 533(1951). Results indicate that peroxidation of polymerized linseed oil is not concerned in the development of any toxic factor, and also suggest that a lack of vitamin E is not involved in the growth inhibition resulting from ingestion of heated oil.

The effect of cis-vaccenic acid on respiration and growth of Bacillus subtilis. H. Laser (Univ. Cambridge). *Biochem. J.* **48**, 164(1951). The "double action" of fatty acids on bacterial growth, that is the initially inhibiting and subsequently stimulating action of fatty acids on bacterial growth, is explained on the basis of penetration of the acid into the cell. The oxidative system is at first inhibited during which time the organisms gradually metabolize the fatty acids. The bacteria then develop a protective mechanism resembling acquired drug resistance. The *trans*-vaccenic is about half as active as the *cis*-form.

Bacteriological studies on margarine. V. D. Foltz and T. H. Lord (Kansas State College, Manhattan). *Food Research* **16**, 216(1951). Present day margarine appears to have a microbial population similar in magnitude and variety to that of many other processed foods. Of the 50 samples examined, 42% gave plate counts of 100 bacteria or less per ml.

Cottonseed meal for chicks. G. R. Grau (Univ. Calif., Berkeley). *California Agr.*, **4**(9), 14(1950). Expelled cottonseed meal can be fed to chicks and broilers at levels as high as 40% of the diet. Lower levels are recommended for commercial use. Such rations should not be fed to laying hens, because cottonseed meal lowers egg quality. (*Biol. Abs.* **25J**[4], 8)

Linseed oil meal. F. H. Kratzer (Univ. Calif., Davis). *California Agr.* **4**(8), 10(1950). When fed at 30-47%, linseed oil meal is harmful to turkey poults. Treatment of the meal with water or supplementation with pyroxidine improved growth and survival. (*Biol. Abs.* **25J**[4], 8)

Use of defatted groundnut cake flour as food. S. B. Lab and A. Bose (Public Health Lab., Patna, India). *Indian Med. Gaz.* **85**, 322-25(1950). Defatted groundnut cake flour was fed to boys (7.8 years average age) at the 10, 15 and 20% level. The boys could digest the flour only up to 1.05 oz. a day but at this level it could be given safely. (*Biol. Abs.* **25J**[4], 7)

Preliminary note on supplementation of oil cakes in pig feeding. Palm oil cakes. R. Jacquot and E. Payen. *Compt. Rend Acad. Agr. France* **36**, 199-202(1950). In pig nutrition sunflower cake efficiently supplements palm oil cake, while soya, peanut and linseed cakes are relatively ineffective. (*Biol. Abs.* **25G**[3], 32)

Toxicological studies on isopropyl and stearyl citrates. H. J. Deuel, Jr., S. M. Greenberg, C. E. Calbert, R. Baker and H. R. Fisher (Univ. So. Calif., Los Angeles). *Food Research* **16**, 258 (1951). Isopropyl citrate and stearyl citrate have been shown to be harmless to rats at levels as high as 1.1 and 10% of the diet, respectively. There is no evidence from acute experiments on rats, rabbits or dogs of any toxicity as measured by growth, mortality or pathological manifestations. The thorough testing program described in this article should serve as an illustration of what constitutes adequate testing of new food chemicals.

Stability of carotene and vitamin A in dry mixtures. M. E. Wall and E. G. Kelly (Eastern Reg. Res. Lab., Philadelphia, Pa.). *Ind. Eng. Chem.* **43**, 1146(1951). The stability of dry carotene or vitamin A mixtures was found to increase as storage temperature decreased, and to increase as the concentration increased. Soybean meal was the best carrier; chick mash was inferior.

The absorption of fatty esters in the mouse intestine. J. F. Mead, L. R. Bennett, A. B. Decker and M. D. Schoenberg (Univ. Calif. at Los Angeles). *J. Nutrition* **43**, 447(1951). Methyl esters of the higher fatty acids are not emulsified to any extent in the intestine of the fasted mouse. The intestinal absorption of fatty esters has been found to be subnormal in the fasted mouse and to be brought to normal by the addition of corn oil. Emulsion formation is necessary for optimum absorption.

The relation of the chemical structure of dietary triglycerides to their absorption in the small intestine. A. C. Frazer, J. M. French and H. G. Sammons. *Abstracts Commun. 1st Intern. Congr. Biochem.* (Cambridge, England) **1949**, 12-13. The claim of Mattil that differences in the assimilability of fats depends upon stearic acid content is not completely correct, although the length of the fatty acid chains has an effect. In rats, double adrenalectomy depressed the absorption of long-chain fats but not tributyrin. Castor oil mixed with the food of rats was absorbed as well as olive oil. No catharsis occurred. Tristearin and stearic acid were not as readily absorbed as triolein and oleic acid. Rancid oil (peroxide value 200) as 10% of the diet of rats caused diarrhea and a fat-absorption defect, but tolerance developed in animals which survived. Rancid oil as 25% of the diet was fatal. (*Chem. Abs.* 45, 4328)

The fate of branched-chain fat acids in the animal body. IV. The biochemical breakdown of fat acids in natural series. T. Yamakawa (Univ. Tokyo). *J. Pharm. Soc. Japan* **70**, 633-7 (1950). Side-chain fat acids having 16 and 17 C atoms underwent ω-oxidation at first, then β-oxidation, finally liberating the 2 C-atom fragments from the end. (*Chem. Abs.* **45**, 4323)

The action of dl-α-tocopherol on metabolism. J. Frey (Univ., Freiburg, Germany). *Klin. Wochschr.* **27**, 348-9(1949). Vitamin E will stimulate general metabolism, especially in the case of growing cells. If there is pituitary deficiency vitamin E is not effective. Vitamin E acts as a stimulant on cell metabolism. (*Chem. Abs.* **45**, 4318)

On the utilization of fatty acid by the body. V. Capraro, M. Pasargiklian and E. Marazzi (U. Milan, Italy). *Arch. Sci. Biol.* (Bologna) **34**(1), 41-52(1950). In absolute fasting the muscle of both the guinea pig and the albino mouse does not show any change in its percentage fat content as compared to its fed stage. However, the proportion of unsaturated fatty acids increases in the muscular tissue. The liver of the albino mouse contained a greater amount of unsaturated acids than observed in the muscular tissue under similar conditions. In a diet containing fats only, the degree of unsaturation of the liver fats decreased when compared to that which it had when fasting. There was an increase in the total fat concentration. (*Biol. Abs.* 25[3], 14)

• Waxes

E. H. McMullen, Abstractor

Fatty alcohols from wool wax unsaponifiables by urea-complex formation. E. von Rudloff (Nat'l. Chemical Research Lab., Council for Sci. and Ind. Research, Pretoria, South Africa). *Chem. and Ind.* **17**, 338(1950). The fatty alcohols present in wool wax unsaponifiables were separated from components having more complex cyclic structures by formation of urea-complexes in ethanol. The complex is separated by filtration, purified by recrystallization from ethanol and decomposed in a mixture of water and ether. Analysis of the recrystallized mixture of monohydric alcohols indicates an average chain length of C_{26}.

Chemical composition of ponderosa and sugar pine barks. E. F. Kurth, J. D. Humphrey, and J. K. Hubbard. *Paper Tr. J.* **130**, No. 17, 37, 38, 40, 42(1950). Chemical analyses of ponderosa pine and sugar pine showed the extractives to range from 23.2 to 28.7 and from 21 to 22%, respectively, the tannin contents being 5.6-11.4 and 4.9-7.1%. Analytical details including lignin, wax, sugar, and coloring matter are discussed. (*Brit. Abs.* **BII**, Oct., **1950**, 935)

Self-polishing floor waxes. Campiero Camperio. *Ind. vernice* (Milan) **5**, 18-19(1951). A review.

Utilization of lignite. D. Chandra. *J. Geol. Inst. Presidency Coll., Calcutta* **12**, 59-65(1949-50). The possibility of extraction of waxes from Indian lignites is discussed. (*Chem. Abs.* **45**, 4910)

Beeswax from Zanzibar. E. Brown, T. J. Coomes, and M. W. Jarvis. *Colonial Plant and Animal Products* 1, No. 3, 230-31 (1950). Beeswax from Zanzibar was analyzed and found to be comparable to the requirements of the British Pharmacopiea 1948. Acid value 18.3, sap. value 77.0, m.p. 63.6, n^{80} 1.4387.

• Drying Oils

Stuart A. Harrison, Abstractor

A survey of the more recent methods of oil improvement. B. F. H. Scheifele. *Deut. Farben-Z.* **5**, 37(1951). A review of segregation, isomerization, copolymerization with styrene, etc., re-esterification and other methods of making improved drying oils. (*Chem. Abs.* **45**, 4463)

Paint, varnish and plastics chemistry. C. R. Bragdon and M. M. Renfrew. *Ind. Eng. Chem.* **43**, 1272(1951). A historical review of the paint, varnish and plastic industry growth in the United States during the past 75 years.

Formation of conjugated double bonds by heating unsaturated oils. S. Veno and H. Sakurai. *J. Chem. Soc. Japan*, Ind. Chem. Sect., **52**, 256(1949). By using sunflower, linseed, and sardine oils the formation of conjugated double bonds by simple heating without any catalyst was studied. The best condition for the reaction was to heat the oils for 30 min. at 320°. When they were heated for 30 min. at 300°, 320°, 340° their diene values increased respectively from 2.3 to 4.9, 7.4, 5.3 for sunflower, from 1.9 to 3.1, 8.4, 4.1 for linseed and from 1.1 to 5.2, 11.6 for sardine. (*Chem. Abs.* **45**, 4463)

Oiticica oil. K. Hrabe. *Chem. Obzor.* **25**, 181(1950). The discovery of oiticica trees in Brazil, their botany, and agricultural importance are discussed. The use of oiticica oil in polymerized form in the production of quick-drying varnishes, alone or in the mixture with tung and linseed oil is recommended. (*Chem. Abs.* **45**, 4463)

Study of the drying and hardening of coatings by means of the Persoz pendulum. A. Weiss and C. Grenet-Delisle. *Congr. tech. intern. ind. peintures inds. assoc.* 1, 255(1947). The coating is applied in known thickness to a metal panel. A Persoz pendulum is attached and the progress of drying and hardening of the coating is followed by measuring at intervals the rate of damping of the pendulum. A drawing of the apparatus and some typical results are given. (*Chem. Abs.* **45**, 4943)

Investigation by means of ultraviolet spectroscopy of the catalytic bodying of linseed oil (comparison with the uncatalyzed process). A. Maschka and A. Mendl. *J. Polymer Sci.* **5**, 429(1950). The bodying of linseed oil at 285° in CO_2 with and without Ni on asbestos as catalyst was studied by determining iodine number, viscosity, density, index of refraction, acid number, and absorption spectra at 2200-3000 A. throughout the process. The results are consistent with the intermediate formation of compounds with conjugated double bonds, followed by their disappearance, probably through a Diels Alder reaction. The catalyst accelerates all reactions involved. An attempt is made to clarify the relation between re-esterification and increased molecular weight from a study of the increase in viscosity and decrease in iodine number. (*Chem. Abs.* **45**, 4944)

Preparation of varnishes with maleinized oils and their properties. S. S. Gutkin. *Official Digest Federation Paint and Varnish Production Clubs.* No. 317, 371(1951). Maleinized fish oil, maleinized linseed oil and maleinized bodied linseed oil were used in the preparation of a white grinding vehicle, a floor varnish, and a spar varnish. The following conclusions were drawn: (1) The bodying rate of the maleinized oils is greatly improved over the parent oil, e.g. maleinized bodied soybean oil is between dehydrated castor and linseed oil in rate. (2) Films of the maleinized oils approach those of chinawood in hardness and water resistance. (3) The maleinized linseed oils show excellent alkali resistance when used in conjunction with phenol-formaldehyde varnishes. (4) The maleinized soybean oil was particularly good in resistance to yellowing, being superior to dehydrated castor oil in this respect.

Alkyd resins for better finishes. M. A. Lesser. *Am. Paint J.* **35**, No. 37, 76(1951). This is a review, listing a variety of ways that alkyd resins have found uses in the coating field.

Using radioisotopes to develop organic finishes. T. Dickinson. *Org. Finishing* **12**, No. 6, 14(1951). This is a brief review of work being done at various laboratories on the use of radioisotopes to study problems of finishing surfaces. Radioisotopes are used to determine the degree of dispersion of pigments in a film. They are used to make coatings conductive so that they will not accumulate a static charge.

Licania mollis and L. venosa fruits from British Guiana. H. Bennett, E. Brown and H. T. Islip. *Colonial Plant and Animal Products* 1, No. 3, 232-236(1950). Both fruits come from evergreen trees and give oils in 23-26% yields. Acid no. 3-17, sap. no. 196-189, iodine value 150-146. Polymerization time 30 min. at 290°. These oils were much like oiticica oil. 50% Keto-elaeostearic acid is present in the oils.

Slash pine oleoresin from British Honduras. H. T. Islip and W. S. A. Matthews. *Colonial Plant and Animal Products* 1, No. 3, 217-222(1950). The pine trees were tapped and the resin obtained was separated into rosin and turpentine. The properties of both products matched very closely those from the U. S.

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Interpolymer formed from monovinyl aromatic polymer, drying oil or acid, polyhydric alcohol and polybasic acid. E. G. Bobalek. *U. S. 2,549,767.* A modified low molecular weight polystyrene was prepared by polymerizing styrene in the presence of para-phenylphenol-formaldehyde resin. The resin formed (60 g.), conjugated linseed oil fatty acids (200 g.), pentaerythritol (80 g.), phthalic anhydride (60 g.) and litharge (.5 g.) were heated to about 240° in an atmosphere of CO_2 for three hours. A 60% solution of the product in xylene had a viscosity of E-G on the Gardner-Holdt scale. The resin-oil baked in 30 minutes at 250° F. to a tough and durable film.

Coating compositions from soybean oils. A. J. Lewis, H. A. Moser and J. C. Cowan. *U. S. 2,550,703.* The drying rate of a semi-drying oil such as soybean oil is greatly improved by including 4-10% of calcium oxide as a pigment. This amount of calcium oxide does not cause early failure of the paint film by cracking or checking.

Oleoresinous varnishes and methods for preparing them. J. J. Bradley, Jr. *U. S. 2,550,961.* Bodying of drying oils is greatly accelerated and conducted at relatively low temperature by the use of a BF_3 catalyst, e.g., an 18-gal. oil length varnish was made by the following formula: china-wood oil 125 pts., rosin-modified phenol-formaldehyde resin (Amberol F-7) 100 pts., linseed oil 15.6 pts., mineral spirits 223 pts., and aromatic hydrocarbon (Solvesso No. 100) 9.0 pts. The resin was dissolved in the cold mineral spirits and 7.5 pts. of BF_3 diethyl ether complex dissolved in the Solvesso was added with stirring. The oils were then added and the batch stirred at 75° F. until the viscosity reached G-H (Gardner-Holdt scale). The catalyst was then killed by adding 7.5 pts. of CaO. The oil was then filtered. Other oils and resins may be used.

Interpolymers of castor-oil maleate. P. O. Tawney. *U. S. 2,551,352.* A castor oil maleate is copolymerized with styrene (or vinyl acetate) and trichloroethylene using benzoyl peroxide catalyst. The use of trichloroethylene as the third polymerizable component greatly increases the solubility of the interpolymer. The interpolymer can be dissolved in xylene and combined with urea-formaldehyde in xylene. Films of the mixture bake to clear, tough, insoluble films in 30 minutes at 150°.

Interpolymers of castor-oil maleate. P. O. Tawney. *U. S. 2,551,353.* Similar to U. S. 2,551,352 except that cyclic terpenes are used in place of trichloroethylene. The cyclic terpenes illustrated were turpentine, dipentene, and alpha-pinene.

Esters of unsaturated fatty acids and glycol ethers in copolymers of cyclopentadiene and unsaturated glyceride oils. E. W. Moffet and W. K. Hoya. *U. S. 2,551,387.* An ether polymer of ethylene glycol such as "Carbowax 1000" is esterified with linseed fatty acids to form either the diester or the monoester. The ester is then heated in an autoclave at 275° for four hours with linseed oil and dicyclopentadiene. The resulting product makes a good grinding vehicle and gives films which air dry. The dried films have superior gloss, clarity and depth.

Acylation with conjugated diene acids. L. Shechter. *U. S. 2,552,872.* A drying oil comparable to tung oil can be prepared by esterifying castor oil with a monocarboxylic acid having one or more double bonds, one of which is conjugated with the acid carboxyl. Castor oil esterified in this manner may be mixed with slow drying oils, such as soya bean oil, to improve their drying rate.

Method for improving drying and semi-drying oils. F. Stejskas. *U. S. 2,553,429.* Refined linseed oil was mixed with a catalyst consisting of 60% nickel and 3% sulfur bound to the nickel and 37% kieselguhr. About 7% of this catalyst was used. The mixture was heated for one hour at 180° then cooled and filtered. The product had a diene number of 26 and a viscosity of 1.2 poise. When this oil was heated to 285° for six hours the viscosity increased to 120 poise. The untreated oil required 36 hours at 285° to reach this viscosity.

Esters of polyallyl alcohol. D. E. Adelson and H. F. Gray. *U. S. 2,555,775.* Allyl alcohol was polymerized at 100° using hydrogen peroxide as the initiator. After 116 hours a 96% yield of polymer with an average molecular weight of about 300 was obtained. The polyalcohol thus formed was esterified with linseed fatty acids to give a drying oil. With lead, manganese and cobalt drier, a film of this oil dried tack-free overnight.

• Detergents

Lenore Petchaft, Abstractor

Textile applications of Nacconol NR. O. M. Morgan (National Aniline Division, Allied Chemical & Dye Corp., New York). *Dyestuffs* **40**, 81-109(1951). Review of the uses of Nacconol NR in wool processing, mohair, cotton, silk fiber and synthetic fiber processing based on such properties as stability to acids, alkalis, oxidizing and reducing agents, and hard water; wetting, scouring and emulsifying ability and rapid scouring action.

Synthetic detergents for domestic dishwashing machines. H. L. Sanders and J. A. Yeager (General Aniline & Film Corp., Easton, Pa.). *Ind. Eng. Chem.* **43**, 866-71(1951). The object of this test was the measurement of deposited films formed on clean glass surfaces when exposed to various wash waters under actual machine conditions. Tests were conducted using water of 300 p.p.m. hardness with two types of soils (one inorganic and the other foodstuff). The tests were run on the following anionic detergents: Antaron L520, a sulfonated amide with very low foam, Antarox A400, an aryl polyglycol ether of medium foam, and Ultrawet K, an alkyl aryl sulfonate with high foam. As a result of the tests it was found that mechanical dishwashing compounds based on low-foaming anionic detergents appear to offer certain advantages over the conventional polyphosphate-alkali mixtures. Using a synthetic of proper formulation, redeposition of inorganic precipitates and foodstuffs is held to a minimum, and the result is brighter glassware and freedom from film formation. In addition, the wetting action of the synthetic enables the water to drain and spread more effectively with greater freedom from salt rings and water spots as a result.

Thermal analysis of the system sodium stearate-cetane. F. H. Stross and S. T. Abrams (Shell Development Co.). *J. Am. Chem. Soc.* **73**, 2825-8(1951). An attempt has been made to obtain a phase diagram of carefully prepared and rigorously dried sodium stearate and cetane by means of differential thermal analysis, supplemented by some visual observations under polarized light. This diagram indicates that there is no appreciable interaction between soap and medium below about 140°. At higher temperatures, however, the transition temperatures of the soap are depressed by the addition of solvent, but the depression is constant over most of the concentration range studied. Approximate measurements of the latent heats were made and the summed molal latent heats for sodium stearate and the summed partial molal latent heats for the soap in the solvent were found to amount to about 10,700 g. calories.

Investigation into the usefulness of four fluorescent bluings in the washing of white and colored fabrics. C. J. Seigers and K. J. Nieuwenhuis. *Mededel. Proefstat. Wasind.*, No. 73, 6 pp. (1950). Results are given of an investigation of the value of four types of fluorescent bluings (Uvitex RS, Uvitex RBS, Pontamine White BR and Tinopal BV) in the usual Dutch laundering process for cellulose fiber materials, cotton, linen and artificial silk, both white and colored. (*Chem. Abs.* **45**, 3602)

Some properties of alkali salts of fatty acids. I. Wetting capacity and capillary activity. E. Otero Aenlle, R. Cadorniga Carro, and W. Pomares Boix. *Anales real soc. espan. fis. y quim.* **45B**, 1337-60(1949). The wetting capacities of Na and K salts of capronic, caprylic, butyric, stearic, palmitic, and oleic acids were studied in 0.1% solutions. The values obtained were compared with surface tension measurements. It was determined that the capillary activity was not the only factor affecting wetting capacity. The effect of cation, addition of NaOH, electrolytes, and alcohol on wetting activity and surface tension were studied. There was no correlation between wetting capacity and surface tension. An explanation of the results based on formation of micellar aggregates is presented. (*Chem. Abs.* **45**, 4467)

The measurement of detergent strength. J. G. Davis. *Food Manuf.* **26**, 13-18, 53-8(1951). A review with 17 references. (*Chem. Abs.* **45**, 4469)

The solubilization of four typical hydrocarbons in aqueous solutions by three typical detergents. J. W. McBain and K. J. Lissant (Stanford University, Calif.). *J. Phys. Colloid Chem.* **55**, 655-62(1951). Solubilization has been carefully measured at 25° for four liquid hydrocarbons—n-hexane, cyclohexane, cyclohexene, and benzene—in three concentrations of potassium laurate (C_{12}) as representative of an anionic detergent, dodecylamine hydrochloride (C_{12}) as a cationic detergent, and Triton X-100 as a nonionic detergent. The measurements included the effects of slight departures from neutrality caused by adding excess acid or basic constituents. Benzene is by far the most strongly solubilized by the ionic detergents, but the opposite holds true with Triton X-100. The cationic detergent is much the best for the liquid hydrocarbons, but Triton X-100 scarcely equals potassium laurate. The nearly constant level of solubilization by a mole of soap is attended by maxima and minima observed with the change in the concentration of the other detergents, confirming previous evidence that in different concentration ranges micelles of different solubilizing power are to be found.

Efficiency rating of washing machines. H. J. Wollner and A. I. Anderson (American Conditioning House, Inc., Boston, Mass.). *Am. Dyestuff Reptr.* **40**, 337-8(1951). Methods have been developed for calibrating washers in terms of speed and effectiveness of dirt removal as well as effect on fabrics. Such methods, with reference to dirt removal efficiency, are based on the fact that the amount of dirt removed from a fabric, under standardized conditions of formula and loading, is directly a measure of the efficiency of the washer. After the washer is run according to a specified formula with accurate control, the pieces are measured by a photometer for determination of the degree of soil removal. This degree of soil removal is an index of the washing efficiency of the washer under test.

The sorption of synthetic surface active compounds by carbon black. G. R. F. Rose, A. S. Weatherburn, and C. H. Bayley (National Research Laboratories, Ottawa, Canada). *Textile Research J.* **21**, 427-32(1951). The sorption on carbon black of a number of types of anionic, cationic, and nonionic surface-active compounds from aqueous solutions has been measured. It is shown that the sorption of these compounds does not conform to the Freundlich adsorption isotherm over the whole of the concentration range studied. The sorption of sodium alkyl sulfates increased with increasing chain length of the alkyl group at constant temperature, and decreased with increasing temperature at constant chain length. A series of compounds differing widely in chemical constitution, and including both anionic and cationic agents, were shown to be remarkably similar with respect to the general level of adsorption. Two typical nonionic compounds were found to be sorbed somewhat more strongly, particularly at higher concentrations, than any of the other compounds investigated. The addition of sodium sulfate to solutions of anionic compounds resulted in an increase in the sorption of the latter in every case.

Substitution of coconut oil in soap. S. C. Gupta, J. S. Phadnis, and J. S. Aggarwal. *J. Sci. Ind. Research* (India) **9B**, 275-8 (1950). Coconut oil can be substituted with advantages in soap manufacture by mixtures of lauric acid-rich fats such as Pisa fat, castor oil, peanut oil, and hydrogenated rosin. (*Chem. Abs.* **45**, 4949)

Non-ionics in the dry cleaning industry. G. E. Barker and H. J. Ranauto (Atlas Powder Co., Wilmington, Del.). *Soap Sanit. Chemicals* **27**, No. 6, 43, 45, 47, 57(1951). Non-ionic surface active agents are excellent products for manufacturing dry cleaning detergents. These detergents show excellent cleaning ability, high whiteness retention, no odor development, good emulsifying properties of the desired type, and economy in use. Non-ionic detergents are very useful in the wet-cleaning department. They show excellent detergency on many types of fabrics, are non-injurious to dyestuffs; and they are useful in acid or salt solutions.

Soil removal from nylon. A study of the effect of various washing conditions. Barbara N. McKee and Elizabeth D. Roseberry (Purdue U., Lafayette, Ind.). *Rayon, Synthetic Textiles* **32**, No. 5, 62-4, No. 6, 54-6(1951). Results of washing nylon in Launderometer and a washing machine under varying conditions with various detergents gave the following results: At a 0.075% concentration in both Launderometer and washing machine the non-ionic detergent studied gave best results. At concentrations of 0.15 and 0.3% soaps gave best results. Under all conditions tested the sulfonated ester used in these tests was very poor. In general, the alcohol sulfates are better than the alkyl aryl sulfonate and a built detergent is somewhat better than an unbuilt. In general, an increase in the concentration of the detergent will increase the amount of soil removed. For all detergents except the soap and the non-ionic an increase in temperature from 120 to 130 and 145° F. has no effect on the percent of soil removed. An increase in the time of agitation will also increase the amount of soil removed.

Spray drying synthetic detergents. Anon. *Mfg. Chemist* **22**, 186-7(1951). Spray dried synthetic detergents for commercial and household use should be in the form of large uniform particles with sufficient mechanical strength to prevent breakdown in the packing. In addition, they should be free flowing, be characterized by absence of lumping or tendency to lump on storage, and have the required bulk density. Furthermore, such products should be sneeze-free, have good color and odor, and adequate solubility in cold and hot water. Spray dried products may be made either by hot spraying or spray cooling. In spray cooling, only a small amount of water is evaporated, and the solid form is obtained by crystallization of the water with sodium carbonate. Spray cooled products have low active detergent content, are high in sodium carbonate and limited in application. The atomization equipment of spray drying units is of three types: (1) spinning disc or centrifugal atomizer, (2) high pressure jet atomizer, or (3) two fluid nozzle atomizer. Products turned out by the first two units are hollow spherical bead particles, while the third type atomizer yields denser particles of irregular shape and size.

Aluminum soaps. G. Nebbia. *Olearia* **5**, 90-91(1951). A review of current uses and research in this field.

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Liquid soap. R. H. Price. *U. S. 2,551,634.* An improved liquid soap soluble in both water and solvents with high detergent properties consists of the soaps of oleic acid and a cation derived from one of four types of bases (lower alkanol amine, lower amines, ammonia and caustic alkalies) used in conjunction with oleic acid, isopropanol and a glycol ether modifying agent of the formula $R-(OCH_2CH_2)_xOH$.

Washing with soap in hard water. Dobbelman N. V. *Dutch 66,550.* For washing with soap, hard water or even sea water may be used if, first, alkali fluorides are dissolved to precipitate the Ca, Mg, Fe, and Mn ions. Preferably the fluorides are previously mixed with the soap or packed separately. Soda, phosphates, etc., may be added, e.g. soap from palm oil + coconut oil (500) mixed with NaF 500 g. is suitable in a 1% solution for washing in water of 100° (German) hardness; soap 500 from coconut oil mixed with NaF 1500 g. in a 2% solution is suitable for washing in sea water. (*Chem. Abs.* **45**, 4471)