SUMMARY.

1. Analysis was made of the kernels of *Quercus rubra* and of the oil which they contain.

2. The oil consists largely of glycerides of oleic, linoleic, stearic and palmitic acids. It conforms closely to other fatty oils used in medicine.

THE BARK OIL OF DOUGLAS FIR.[*]

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The bark of the young Douglas fir, *Pseudotsuga taxifolia* (Poir.) Britt., is characterized by the presence of numerous resin blisters which disappear as the tree grows older while the bark becomes thicker and deeply furrowed. It was from this young bark that the oil used in this investigation was obtained.

EXPERIMENTAL.

Pieces of bark were cut from selected trees growing in the vicinity of Seattle, Washington, and subjected to steam distillation. From 64 pounds of fresh bark there was obtained a total of 338 cc. of oil which corresponded to a yield of 1.01 per cent. The oil was slightly greenish in color and possessed a very pleasing aromatic odor.

The physical constants of the oil were determined in the usual manner with the following results: d_{20} 0.8721; n_D^{20} 1.4750; $[\alpha]_D^{23}$ −24.25°; saponification number 11.9; acid number 0.71; ester number (calculated) 11.19; per cent of ester (calculated as geranyl acetate) 3.9; saponification number, after acetylization 62.4; per cent of total alcohol (calculated as geraniol) 17.5; per cent of free alcohol (calculated as geraniol) 14.4.

Free Acids.—Extraction of 250 cc. of the oil with a 5 per cent aqueous solution of sodium carbonate gave 0.2102 Gm. of a brown gummy residue which was slightly acid to litmus and possessed a faint odor. The residue was dissolved in ether and steam distilled, whereupon an aqueous distillate was obtained on the surface of which floated a small amount of insoluble material. Attempts were made to identify acids present in both the soluble and insoluble distillates but without success. The odor of the distillates as well as their reactions to litmus indicated at least the presence of traces of acids such as capric or caproic.

Phenols.—Extraction by 5 per cent aqueous solution of sodium hydroxide yielded 0.1767 Gm. of a resinous brown residue possessing a faint odor. The residue did not respond to any of the general tests for phenols, hence it was concluded that no phenols were present in the bark oil.

Fractionation.—The oil, which had been extracted with the sodium carbonate and sodium hydroxide solutions, was washed with water and dried. The 238 cc. of oil which remained were fractionated at 25-mm. pressure and that portion boiling up to 100° C. was separated. This lower boiling portion, which measured 184 cc. and represented 73.6 per cent of the original oil, was resolved into its various constituents by repeated refractionations. The fractions as finally obtained, together with their physical constants, are as follows:

Fraction No.	Boiling Point at 25 Mm.	Amount.	Sp. Gr. 20° C.	n_D^{20}.	$[\alpha]_D^{23}$.	Color.
I	65–71° C.	88 cc.	0.8575	1.4751	−35.21°	Colorless
II	71–80	75	0.8586	1.4804	−25.59	Colorless
III	80–100	21	0.8720	1.4866	−11.08	Colorless

Levo Alpha Pinene.—A portion of the first fraction was oxidized to pinonic acid with potassium permanganate according to the method of Tiemann and Semmler (1). The semicarbazone

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which was formed by treating the acid with semicarbazide hydrochloride melted, after purification at 203° to 204° C. No depression of the melting point was noted when mixed with the semicarbazone of known pinonic acid. The preparation of this derivative showed the presence of alpha pinene in the fraction.

Levo Beta Pinene.—A small amount of Fraction I was oxidized to nopinic acid according to Wallach's Method (2). After several recrystallizations from ether, the acid melted at 126° to 127° C. The preparation of the acid identified beta pinene.

Levo Camphene.—In addition to the alpha and beta pinenes, camphene was also identified as being present in the first fraction. A 30-cc. portion of the fraction was hydrated by the well-known Bertram and Walbaum method (3). After hydration there remained 24 cc. of non-reacting material which was discarded. The isoborneol which was obtained as a result of the saponification of the bornyl acetate was purified by recrystallization from petroleum benzene and melted at 203° C. The phenylurethane melted at 136° C. Based on the fact that 24 cc. of the fraction was discarded it was assumed that the fraction contained approximately 20 per cent camphene.

Fraction II contained traces of both alpha and beta pinene.

Dipentene.—A portion of the third fraction was diluted with ether and the well-cooled mixture saturated with HCl gas. As a result the crystalline dihydrochloride was obtained, which after purification melted at 50° C. When mixed with the dihydrochloride of pure d-limonene the melting point was found to be 49° C. Since limonene dihydrochloride depresses considerably the identical melting point of terpinene dihydrochloride but not that of the dipentene compound, it was concluded that this fraction contained limonene or dipentene but not terpinene. To differentiate between the two former compounds the tetrabromide was prepared, according to the method of Wallach (4). Repeated recrystallization from ethyl acetate failed to raise the melting point above 118° C., although a melting point of 123° to 124° C. is given in the literature for dipentene tetrabromide. Although the melting point of 118° C. would indicate the presence of traces of limonene it was concluded that dipentene was the chief constituent of the fraction.

Saponification of the Higher Boiling Portion.—The higher boiling oil was saponified by heating with alcoholic potassium hydroxide and then submitted to several refractionations at 25-mm. pressure.

Fraction No.	Boiling Point at 25 Mm.	Amount.	Sp. Gr. 20° C.	n_D^{20}.	$[\alpha]_D^{26}$.	Color.
I	105–125° C.	14 cc.	0.8910	1.4877	−11.6°	Yellowish
II	125–150	2	....	1.4878	− 6.0	Yellowish
III	150–190	2.5	0.8820	1.5075	0.0	Greenish
IV	150 and above	2	....	....	....	Black

Geraniol.—Both Fractions I and II were dissolved in pyridine and treated with diphenylcarbamine chloride according to the method of Erdmann and Huth (5), with the result that in each case geraniol diphenylurethane was obtained. The crystalline derivative after several recrystallizations from hot alcohol melted at 82° C. Due to the large amount of this derivative formed it was concluded that both fractions consisted almost entirely of geraniol.

Azulenogenic Sesquiterpenes.—The presence of azulenogenic sesquiterpenes in the third high boiling fraction was indicated by treatment according to S. & H. Sabetay's method (6). Due to the small amount of fraction no further attempts at identification were made.

Fraction IV which consisted of a brown tarry residue showed signs of partial decomposition and no analysis was made.

Combined Acids: Acetic Acid.—The alkaline solution obtained from the saponification of the oil was evaporated to dryness, and the residue was made acid and distilled. A very small amount of insoluble distillate was obtained from which it was impossible to prepare satisfactory silver salts. The aqueous portion of the distillate when made alkaline and evaporated to dryness gave the general qualitative tests for acetic acid. The combined acids, therefore, consisted of acetic acid together with possible traces of acids of higher molecular weight, as indicated by the odor.

SUMMARY.

The bark from the young trees yielded 1.01 per cent of volatile oil consisting of approximately 75 per cent of terpenes and 16 per cent of higher boiling con-

stituents including an alcohol and probably sesquiterpenes. The oil contained about: 28 per cent levo alpha pinene; 24 per cent levo beta pinene; 7 per cent levo camphene; 8 per cent dipentene; 6 per cent geraniol partly as the acetate; a small amount of azulenogenic sesquiterpene. Traces of free acids were present, probably capric or caproic, while acetic acid was present in the combined state.

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THE EFFECT OF CYSTINE ON THE TOXICITY AND TRYPANOCIDAL ACTIVITY OF NEOARSPHENAMINE.[*]

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It is well known that neoarsphenamine injected intravenously in aqueous solution at times causes undesirable reactions of varied nature and severity. Consequently many attempts have been made to find some substance or substances which could be used either simultaneously with neoarsphenamine or during the course of the treatment to reduce both the frequency and severity of these reactions or eliminate them altogether. Particular attention has been paid to sulfur compounds owing to the effectiveness of sodium thiosulfate in arsenic poisoning reported first by Ravaut (1) and then by McBride and Dennie (2). Subsequently Raiziss (3), Groehl and Myers (4) and many others have pointed out that sodium thiosulfate might have a favorable effect in preventing neoarsphenamine reactions when given at the same time as the arsenical. At the present time, however, sodium thiosulfate is used in arsphenamine therapy, mainly for the treatment of the more severe occasional reactions such as dermatitis, jaundice; it hastens elimination of the arsenic.

More recently Sullivan (5) has pointed out that cystine is one of the amino acids most necessary to normal body growth and maintenance and plays an important rôle in nutrition. It has also been reported by Sullivan in a private communication that colloidal sulfur therapy in arthritis raised the cystine content of the nails from the subnormal level of 8.67% to 10.78%, a close approach to the normal value of 12%. Also cystine is a known constituent of the hair. Further, it has often been reported that in instances of arsenical poisoning arsenic has been found in the skin, hair and nails. It appeared possible, then, on the basis of a consideration of the chemistry of cystine in relation to the chemical reactions of arsphenamines in the body, to convert the excess arsenic present in the skin before