optical antipodes. Quinine in ethanol and brucine in methanol were found to give the best results.

The racemic acid, prepared through the anhydride [1], had the m.p. 100–102°. The value 82–83° reported by previous authors [2] obviously refers to an unstable modification. The optically active acid melted at 129–131°.

Experimental. The anhydride was prepared by conventional methods [1]. After distillation *in vacuo* and recrystallisation from ethyl acetate + hexane, it melted at 94–95°. It was hydrolysed with boiling water (30 minutes); after extraction with ether and evaporation of the solvent, the acid was obtained as a gradually crystallising syrup. After recrystallisation from formic acid, it melted at 98–101°; further recrystallisation from ether + petrol ether raised the m.p. to 100–102°.

33.5 g racemic acid and 104 g quinine were dissolved together in 800 ml 96-% ethanol. The salt obtained after standing over-night was recrystallised seven times from the same solvent. The activity of the acid was practically constant from the fourth recrystallisation. The salt obtained (32.8 g) was decomposed with dilute sulphuric acid and the phenylglutaric acid isolated by extraction with ether. M. p. 129–131°. (Found: equiv.wt 104.7. $C_{11}H_{12}O_4$ requires 104.1. $[\alpha]_D^{25} = +85.8°$, $[M]_D^{25} = +178.5°$ in ethanol solution.)

The mother liquor from the first crystallisation of the quinine salt was evaporated and the acid liberated. 13.7 g with $[\alpha]_D^{25} = -46.8°$ was obtained. It was dissolved with 62 g brucine in 150 ml methanol. The salt obtained after 24 hours was recrystallised seven times from the same solvent; after five recrystallisations, the activity of the acid was constant and had practically the same maximum value as the antipode. The yield of salt was 27.9 g.

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Synthesis of Racemic Methyl Phthienoate

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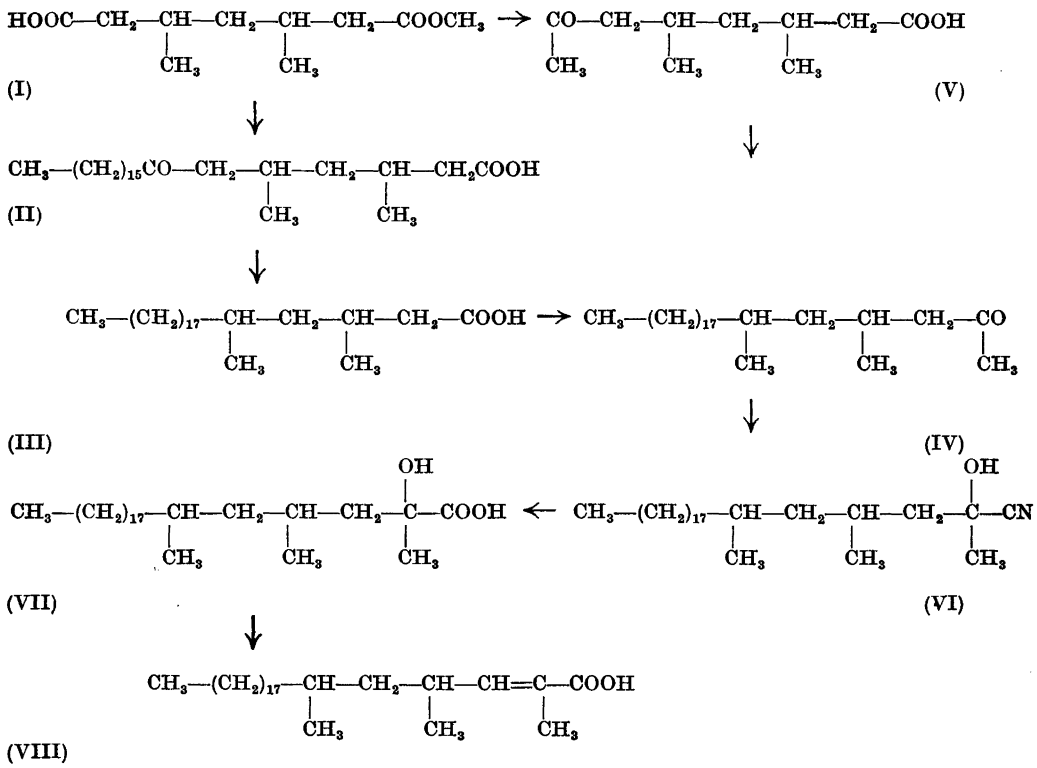
In the lipids of a human strain of the tubercle bacillus Anderson and Chargaff in 1929 [1,2] found a dextrorotatory, branched chain fatty acid which they called phthioic acid. When injected into animals, this acid was found [3] to produce epitheloid cell tissue reaction characteristic of tuberculosis. The elucidation of the chemical structure of the compound proved difficult and has been achieved only recently, mainly as a result of work by Polgar *et al.*[4–6] at Oxford and by Cason *et al.*[7–9] at Berkeley. After the α,β-unsaturation of the acid had been recognized [4,7] the new names mycolipenic acid-I[b] and C_{27}-phthienoic acid [8] were suggested. According to Cason and Sumrell [8] several homologues of C_{27}-phthienoic acid are present in the lipids of tubercle bacilli.

On the basis of the above-mentioned degradation studies at Oxford and Berkeley, and synthetic work performed at Uppsala, Ställberg-Stenhagen [10] suggested that C_{27}-phthienoic acid ** is *trans*-2,4L, 6L-trimethyl-$\Delta^{2:3}$-tetracosenoic acid. This conclusion has been strengthened by Fray and Polgar's recent synthesis [11] of (+)-2L,4L-dimethyldocosanoic acid, a degradation product of the natural compound. The synthesis of the *cis*- and *trans*-DL-erythro isomers of methyl 2,4,6-trimethyl-$\Delta^{2:3}$-tetracosenoate has now been performed through the following sequence of reactions:

* Rockefeller Foundation fellow.

** We prefer this name because of its similarity with the name originally proposed by R. J. Anderson.



Experimental. The starting material, *meso*-3,5-dimethylpimelic acid, has been prepared from 3,5-dimethyl*cyclo*hexanone: free acid m. p. 98.6—99.8°; monomethyl ester (I) n_D^{25} 1.4438, d_4^{25} 1.037; dimethyl ester n_D^{22} 1.4334, d_4^{22} 1.002. By means of Bowman's synthesis 3,5-dimethyl-7-oxotricosanoic acid (II), m. p. 51.3—52.2° and 29.0—29.3° (dimorphism) was prepared (semicarbazone m. p. 104—109° (decomp.)). Reduction of this acid, either by Huang-Minlon's modification [12] of the Wolff-Kishner procedure or by treatment of the ethylene mercaptal with Raney nickel [13] gave 3,5-dimethyltricosanoic acid (DL-erythro form) (III), m. p. 46.4—48.4° and 27.0—27.3° (dimorphism). Methyl ester: m. p. 18.3—18.8°, $n_D^{21.5}$ 1.4500, $d_4^{21.5}$ 0.858; ethyl ester: m. p. 14.8—15.3°, n_D^{22} 1.4495, d_4^{22} 0.854. Through reaction of the acid chloride of the last mentioned acid with methyl cadmium [14] 4,6-dimethyltetracosanone-2 (IV) was obtained, m. p. 20.9—21.4°, n_D^{20} 1.4530, d_D^{20} 0.846 (semicarbazone m. p. 82—83°). The same ketone was also obtained from 3,5-dimethyl-7-oxooctanoic acid (V) (n_D^{22} 1.4494, d_4^{22} 0.9988) and stearic acid through the Kolbe reaction. Treatment of the ketone with hydrocyanic acid gave the cyanhydrin (VI) which without further purification was hydrolyzed to 2,4,6-trimethyl-2-hydroxytetracosanoic acid (VII), m. p. 51.2—52.5° (mixture of diastereoisomers) (methyl ester: m. p. 22.5—23.1°, n_D^{25} 1.4527; I. R. spectrum: bands at 2.85 and 5.77 μ). Pyrolysis of the free hydroxy-acid gave a mixture from which, after methylation and chromatography on alumina, *cis*- and *trans*-isomers of methyl DL-erythro-2,4,6-trimethyl-$\Delta^{2,3}$-tetracosenoate (VIII) were isolated: *cis*-isomer m. p. 35.2—36.6° and 16.3—16.6° (dimorphism), n_D^{25} 1.4587, U. V. spectrum: λ_{max} 217 mμ, ε = 10.240; *trans*-isomer m. p. 14.3—14.7°, n_D^{25} 1.4600, U. V. spectrum: λ_{max} 215 mμ, ε = 12.930 (hexane).

The assignment of geometrical configuration of 2-methyl-2-alkenoic acids has been discussed by Ställberg-Stenhagen [10]

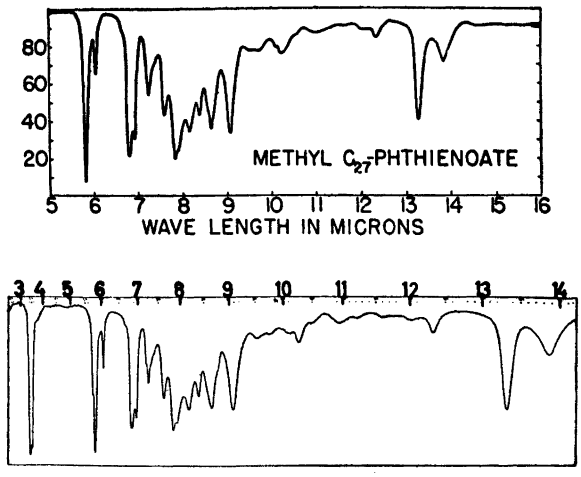


Fig. 1. Infrared absorption spectra.

Upper curve: Methyl C_{27}-phthienoate according to Cason et al.[9]
Lower curve: Synthetic methyl trans-DL-*erythro-2,4,6-trimethyl-$\Delta^{2:3}$-tetracosenoate (liquid, cell 0.02 mm thick).*

and Cason and Kalm [15]. The results of these authors are supported by the X-ray crystallographic work of Robertson and Porte [16] on angelic and tiglic acid.

The infrared absorption spectra of the *cis-* and *trans-*isomers in liquid state are considerably different especially in the region 10 to 15 μ. The spectrum of the *trans-*isomer proved identical with that of a specimen of methyl C_{27}-phthienoate recently isolated by one of us (J.A.) from the strain test of the tubercle bacillus. As shown in Fig. 1 the spectrum also appears identical with that for methyl C_{27}-phthienoate published by Cason *et al.*[9]. The *trans-*configuration of the ester derived from bacterial sources [10,15] is thus confirmed.

Methyl hydrogen 3,5-dimethylpimelate(I) has been resolved into the antipodes, $[\alpha]_D^{25} \pm 1.5°$, and we are now engaged in the synthesis of the optically active *cis-* and *trans-*isomers.

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