taneously converted in the solid phase to the higher melting and stable modification. This conversion may take several weeks at room temperature, but only minutes or hours at 80° C. After melting at 95° C the substance may solidify on further heating and melt again at 110° C. The degree of conversion may be established by X-ray diffraction, but more conveniently by infra-red spectroscopy (Fig. 1).

Some preliminary crystal data for the two modifications of bigeranyl tetrahydro-chloride have been collected for further determination of their structures, and shall be reported here. For the *lower melting form* the unit cell dimensions obtained from oscillation and Weissenberg photographs using CuKα radiation, are: $a = 38.6 \pm 0.1$ Å; $b = 10.20 \pm 0.05$ Å; $c = 5.99 \pm 0.02$ Å, $\gamma = 93.0 \pm 0.3°$, $V = 2\,358$ Å³, $Z = 4$ mol./u.c., $d_{calc} = 1.181$ g/cm³, $d_{obs} \approx 1.18$ g/cm³. Systematic absences are found for $00l$ when l odd; for $hk0$ when k is odd. The same systematic weaknesses of the reflections as for the isomers of squalene hexa-hydrochloride are also found, i. e., $h00$ when h is odd; $0k0$ when k is odd; and $h0l$ when $h + l$ is odd. Space group $P2_1/b$.

A comparison of these data with those of the squalene hexahydrochloride iso-mers [2] will show that the a-axis length for bigeranyl tetrahydrochloride is about two thirds of that of squalene hexahydro-chloride, the other data being very closely the same for both compounds. A one-dimensional projection of electron density on the a-axis has been calculated, and this synthesis also shows that the low melting modification of bigeranyl tetrahydrochlor-ide closely resembles the squalene hexa-hydrochloride isomers, especially the higher melting one; hence, it must be the *meso*-form.

A single crystal of the *higher melting form* of approximate size $0.5 \times 1.0 \times 10$ mm has been prepared. This shows good clea-vages parallel to (100) and (010), but in-ferior parallel to (001). The crystal data for this modification are: $a = 20.91 \pm 0.05$ Å; $b = 9.77 \pm 0.02$ Å; $c = 6.04 \pm 0.02$ Å; $a = 87°$ $13' \pm 10'$; $\beta = 92°$ $52' \pm 10'$; $\gamma = 102°$ $55' \pm 10'$; $V = 1\,175$ Å³; $Z = 2$ mol./u.c.; $d_{calc} = 1.186$ g/cm³; $d_{obs} \approx 1.19$ g/cm³.

By comparing the crystal data and the infrared spectra (Fig. 1) of the two crystal-line isomers it may be seen that marked differences exist, indicating that we have to do with two different conformational

isomers. The spontaneous solid phase con-version of one form into the other can therefore hardly be due to simple transla-tions of the molecules in the crystal lat-tice, but must rather involve a rotation about some of the bonds in the chain. It is instructive to note the remarkable dif-ference between the spectra of these two conformational isomers even in the C—Cl stretching frequency region, $17 - 18$ μ, where one would expect a fairly constant "group frequency". The solution spectrum represents, of course, the equilibrium mix-ture of a very large number of conforma-tional isomers and is accordingly more diffuse and less characteristic.

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Transformation of 2-(β,β-Dicarbo-methoxyethyl)-furan into m-Hydroxybenzoic Acid

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Furans with suitable substituents in the 2-position may be transformed into other systems with aromatic character by methoxylation to cyclic acetals of 1,4-dicarbonyl compounds, followed by intra-molecular condensation in acid solution [1-6]. Further application of this principle has led to the transformation of 2-(β,β-di-carbomethoxyethyl)-furan (I) into m-hydroxybenzoic acid (III) as shown below.

Trans-2-furanacrylic acid was isolated as a by-product of the reaction (yield 2 %). This indicates that to a small extent an ethylenic linkage has been formed in the side-chain of I by oxidation during elec-trolysis.

I was prepared from furfuryl chloride as shown below [cf. 7]. Dimethyl difurfuryl malonate (IV) was isolated as a by-product of this reaction.
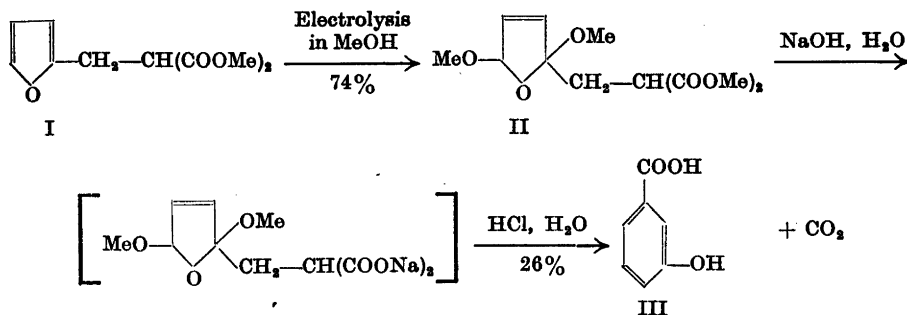
The dimethoxydihydrofuran (II) could, as expected, be catalytically hydrogenated to the corresponding tetrahydrofuran, 2,5-dimethoxy - 2 - (β,β -dicarbomethoxyethyl) - tetrahydrofuran (V).

I, II, IV and V are new compounds, but the free acid and the diethyl ester corresponding to I have been prepared previously [7].

Experimental. 2-(β,β-Dicarbomethoxyethyl)- furan (I). Dimethyl malonate (17.0 g, 0.128 mole) was added to a solution of sodium methoxide in methanol [from sodium (2.80 g, 0.122 mole) and anhydrous methanol (60 ml)]. Furfuryl chloride [8] (14.3 g, 0.123 mole) was added dropwise with stirring during 20 min at 30—40°. The mixture was stirred for a further 10 min at 30° and then heated under reflux with stirring for one hour. The methanol was evaporated in a vacuum and ether added. The mixture was washed twice with cold water and the etheral layer dried with magnesium sulfate. Distillation gave 12.5 g (48 %) of I (colorless liquid, b.p.$_{0.1}$ 83—88°, n_D^{25} 1.4667). (Found: C 56.6; H 5.8; OCH$_3$ 29.0. Calc. for C$_8$H$_6$O$_3$(OCH$_3$)$_2$ (212.2): C 56.6; H 5.7; OCH$_3$ 29.2).

Further distillation gave 1.67 g of pale yellow liquid (b.p.$_{0.1}$ 88—130°), which was discarded, and then 2.81 g of pale yellow liquid (b.p.$_{0.1}$ 130—136°) which crystallized completely on standing, [m.p. 55—60° (Hershberg apparatus, corr.)]. Crystallization of 500 mg from ether gave 310 mg (10 %) of IV (white crystals,

m. p. 67—69°). (Found: C 61.6; H 5.3; OCH$_3$ 21.1. Calc. for C$_{13}$H$_{10}$O$_4$(OCH$_3$)$_2$ (292.3): C 61.6; H 5.5; OCH$_3$ 21.2).

2-5-Dimethoxy-2- (β,β-dicarbomethoxyethyl) - 2,5-dihydrofuran (II). I (4.24 g, 0.020 mole) and concentrated sulfuric acid (412 mg) were dissolved in anhydrous methanol (45 ml) and the solution electrolyzed and worked up as described for the methoxylation of 2-carbomethoxy-5-*iso*propylfuran [9]. The yield was 4.04 g (74 %, current efficiency 59 %) of II (pale yellow liquid, b.p.$_{0.2}$ 129—132°, n_D^{25} 1.4560). (Found: C 52.7; H 6.6; OCH$_3$ 44.9. Calc. for C$_8$H$_6$O$_3$(OCH$_3$)$_4$ (274.3): C 52.6; H 6.6; OCH$_3$ 45.3).

2,5-Dimethoxy-2- (β,β-dicarbomethoxyethyl) - tetrahydrofuran (V). II (2.66 g) and anhydrous methanol (15 ml) were shaken (3 h) with Raney nickel (0.2 g) under hydrogen (100 atm). The product was isolated by distillation. The yield was 2.30 g (83 %) of V (colorless liquid, b.p.$_{0.1}$ 129—131°, n_D^{25} 1.4499). (Found: C 52.3; H 7.3; OCH$_3$ 44.8. Calc. for C$_8$H$_8$O$_3$(OCH$_3$)$_4$ (276.3): C 52.2; H 7.3; OCH$_3$ 44.9).

m-Hydroxybenzoic acid (III) and trans-2-*furanacrylic acid.* II (4.12 g, 0.015 mole) and N sodium hydroxide (45 ml, 0.045 mole) were mixed and heated under reflux (1 h). After cooling the pH was adjusted to 1—1.5 by addition of concentrated hydrochloric acid. The mixture was heated under reflux for 1 h and the dark brown solution evaporated in a vacuum to about 30 ml. The precipitate formed was removed by filtration, washed once
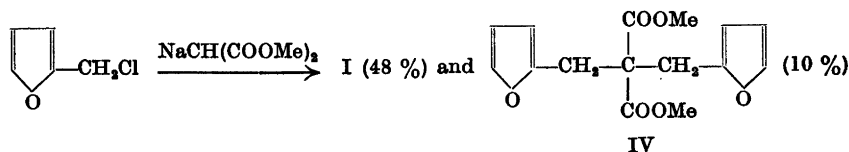
with water and dried (yield 70 mg). Sublimation (110—120°/0.05 mm) gave 47 mg (2 %) of *trans*-2-furanacrylic acid (white crystals, m. p. 140—142°, mixed m. p. with an authentic specimen of *trans*-2-furanacrylic acid 141—143°). [Found: C 60.9; H 4.6. Neut.equiv. 137.8 (phenolphthalein indicator). Calc. for $C_7H_6O_3$ (138.1): C 60.9; H 4.4].

The filtrate from the crude furanacrylic acid was continuously extracted with ether (2 h), the etheral extract dried with magnesium sulfate and the ether evaporated in a vacuum. 1.45 g of a semisolid residue remained. Crystallization from water followed by sublimation (130—140°/0.05 mm) gave 0.53 g (26 %) of III (white crystals, m. p. 197—200°, mixed m. p. with an authentic specimen of *m*-hydroxybenzoic acid 198—200°). [Found: C 61.0; H 4.5. Neut.equiv. 137.8 (phenolphthalein indicator) Calc. for $C_7H_6O_3$ (138.1); C 60.9; H 4.4].

In another experiment the acid solution was not refluxed. After standing for 6 days at room temperature a 6 % yield of *trans*-2-furanacrylic acid was obtained, but no III could be isolated.

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On the Carbohydrate Components of the α₁-Acid Glycoprotein of Human Plasma

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α₁-Acid glycoprotein of human plasma was first isolated in a pure state by Weimer, Mehl and Winzler [1] in 1950. They used ammonium sulphate fractionation under pH control. In 1953, Schmid [2] independently isolated a glycoprotein, called α₁-acid glycoprotein, from the supernatant of fraction V of Cohn's fractionation procedure. Judging from the physicochemical and analytical figures, this substance was considered to be the same one as Weimer *et al.* described.

The α₁-acid glycoprotein is one of the best characterized substances among the numerous plasma proteins. The carbohydrate content is extremely high, amounting to nearly 40 %. Neutral sugars, amino sugars and sialic acids were found by Winzler [1], Schmid [2] and Odin [3].

The present author prepared a certain amount of this glycoprotein for study. After hydrolysis, the substance was analyzed for neutral sugars, amino sugars and sialic acids by means of chromatographic methods. Galactose, mannose, fucose, glucosamine, ovine-type sialic acid and its derivative were determined quantitatively.

In order to investigate the chemical structure proteolytic degradation of the glycoprotein was attempted. At first, the glycoprotein was submitted to a mild hydrolysis in order to remove sialic acids because the intact glycoprotein, was hardly digested by trypsin or papain. The degraded sialic acid free glycoprotein, however, could be digested by trypsin. Actually, a peptide carrying carbohydrate was obtained.

Experimental: Preparation. The electrophoretically pure glycoprotein was prepared principally according to Schmid's method [4]. However, the ethanol concentration was raised to 25 % instead of 20 at the final stage of the fractionation. In this way, the pure substance was regularly obtained, although the yield was somewhat low. Thus, 1 gm of glycoprotein was usually obtained from 50