

molecule lies along the *c*-axis, the length of which, 7.61 Å., is in accordance with this assumption. To find the azimuth round this axis, a Patterson analysis of the [001]-projection was made; this shows a relatively narrow ridge going through the origin and making an angle of about 37° with the *b*-axis. This ridge will correspond to inter-atomic distances in the molecule, which is accordingly approximately flat, lying in a plane through the *c*-axis and intersecting the *a*-*b*-plane along the direction shown by the ridge. A second hump of greater dimensions in the middle of the projection can be interpreted as caused by the inter-molecular distances. As the details of the Patterson analysis were not very clear, owing to many distances overlapping, it was not possible to derive further information from it.

Several models were found to be possible on geometric grounds. Only one of these models gave reasonable agreement with the intensities of the reflections *hkO*, *hOl* and *Okl*. On the basis of this model, Fourier analyses of the projections [100] and [010] were made. The resulting parameters are:

	<i>x</i>	<i>y</i>	<i>z</i>
C ₁	0.021	0.036	0.258
C ₂	0.056	0.067	0.081
O ₁	-0.133	-0.080	0.253
O ₂	0.167	0.142	0.422

The distances between the C-atoms were found to be 1.52 and 1.51 Å., in accordance with the standard distance 1.54 Å. for the single aliphatic bond. In this respect, succinic acid differs strikingly from oxalic acid, where the C-C bond is found to be considerably shortened by the influence of the carboxyl group³. The C-C bonds include an angle of about 110°.

The calculated C-O distances are 1.28 and 1.31 Å.; O-O in the same molecule is 2.28 Å.; the distance between oxygen atoms of different molecules is 2.65 Å.

The details of the structure and of its determination will be published elsewhere.

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¹ Yardley, K., *Proc. Roy. Soc., A*, **105**, 451 (1924).

² la Tour, Dupré, F., *C.R. Acad. Sci. Paris*, **193**, 180 (1931).

³ Robertson, J. M., and Woodward, I., *J. Chem. Soc.*, 1817 (1936).

A New Method of Resolving a Racemic Compound

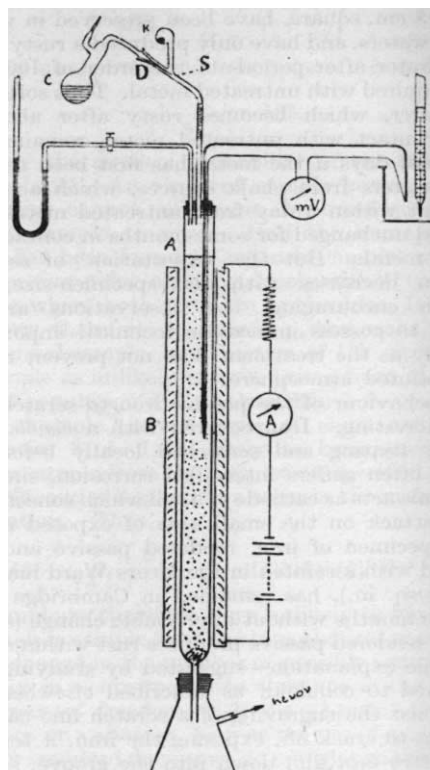
WE have recently developed a new method of resolving a racemic compound by selective adsorption, and the results we have obtained, already published in the *Praktika* of the Academy of Athens (April 1938), agree in the main with similar experiments of G. M. Henderson and Dr. H. Gordon Rule¹.

The method is based upon the different degree of adsorption which an optically asymmetric crystal, as *d*- or *l*-quartz shows, for the two antipodes. The result of this selective adsorption is that when a *d*-*l* solution is passed through a Tswett column, its *d*- and *l*-components are separated and located at different heights.

We used quartz powder prepared from *d*- and *l*-quartz crystals as the asymmetric adsorbing medium and a solution of tri-ethylenediamine chromichloride ((Cr en₃) Cl₃ + 3½ H₂O) as the racemic compound.

We have chosen this compound because of its great molecular rotation power, which is 3,000° for 5890 Å.

The apparatus employed is shown in the figure below. After activating the adsorbing medium by heating in vacuum, we let the racemic solution pass through the column *A* of the quartz powder by breaking the glass end *S* by the metal sphere *K* and tipping up the vessel *C*, thus avoiding contact with any grease.



Then we examined the filtrate in the polarimeter and the solutions obtained by successive elutions of the adsorbed salt by 85 per cent alcohol. As the accompanying table indicates, the solutions obtained

OPTICAL ACTIVITY OF SUCCESSIVE ELUTED SOLUTIONS

Adsorbing medium	I	II	III	IV	V
<i>l</i> -quartz	-0.023	-0.041	+0.020	+0.108	
<i>l</i> -quartz	-0.058	-0.121	-0.018	+0.046	+0.034
<i>d</i> -quartz	+0.023	-0.020	-0.050		

show optical activity. By using *d*-quartz the first elutions are dextro-rotatory and the next solutions are lævo-rotatory. By using *l*-quartz the opposite occurs. This indicates that the asymmetric quartz surface adsorbs more strongly the antipode of the opposite sign.

It is easily shown by a thermodynamic cycle that the selective adsorption of the antipodes by optically asymmetric surfaces can be reduced to a difference in the heat of formation of the adsorbed antipode molecule from adsorbed atoms on the asymmetrical quartz.

These experiments throw a new light on the problem of the genesis of the first substance with optical activity. It is possible that this substance

was formed by many successive adsorptions and elutions of a racemic compound on optically asymmetric surfaces of minerals.

Experiments are in progress with the object of extending the research to other substances; the details of which will be published elsewhere.

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NATURE, 141, 917 (May 21, 1938).

WE are greatly interested to read of the success obtained by Prof. Karagunis and G. Coumoulos in effecting a partial resolution of a complex chromium salt by the use of active quartz. Following up the work of Tsuchida, Kobayashi and Nakamura¹ upon the detection of a racemic inorganic complex by immersing powdered active quartz in its solution, we have also been examining the possibility of extending these results by the use of quartz columns in conjunction with inorganic as well as organic complexes.

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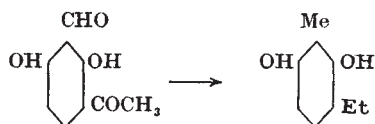
¹ *Chem. Soc. Japan*, 56, 1339 (1935).

Modified Gattermann Reaction: Synthesis of Hydroxy-Formyl-Phenyl-Ketones

ONE of the authors (R. C. S.) with Laiwalla has previously shown that methyl β -resorsylate does not undergo the Gattermann reaction under the usual conditions, that is, in the presence of zinc chloride in ether or in the presence of aluminium chloride in benzene; the reaction takes place readily, however, in the presence of anhydrous aluminium chloride dissolved in dry ether, with the formation of the aldehyde ester, methyl 2:4 dihydroxy-3-formyl benzoate¹.

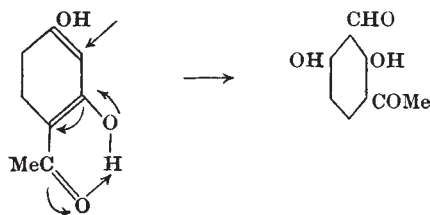
We now find that polyhydroxy-phenolic ketones also give aldehydes in high yields under the condition of Shah and Laiwalla's modified Gattermann reaction¹, the formyl group entering (when possible) the usually inaccessible Y-position in the resorcinol nucleus. Thus resacetophenone gives 2-4-dihydroxy-3-formyl acetophenone, the constitution of which is established by its reduction by the Clemmensen method to 4-ethyl-2-methyl resorcinol of Robinson and Shah².

Orsacetophenone, 2-acetyl resorcinol, 2-4-dihydroxy benzophenone and phloracetophenone afford similarly 2-4-dihydroxy-6-methyl-3-formyl-acetophenone, 2-6-dihydroxy-5-formyl-acetophenone, 2-4-dihydroxy-3-formyl-benzophenone and 2-4-6-trihydroxy-3-formyl-acetophenone respectively.



The orientation of the aldehydes from resacetophenone, orsacetophenone and 2-4-dihydroxy-benzo-

phenone, in which the formyl group enters the 3-position instead of the usual 5-position, is of interest. These results are best explained on the view that the chelation between the hydroxyl and the acetyl group stabilizes the double bonds in the resorcinol nucleus; the carbon atom in the 3-position, which is united by a double bond to the carbon atom bearing the 4-hydroxy group, is thus the point of attack (*cf.* W. Baker³).



The synthesis of such hydroxy-formyl-phenyl ketones opens up various possibilities for the synthesis of heterocyclic compounds containing oxygen in the ring-like coumarino-Y-pyrones, furo-chromones, etc., which are being explored.

A detailed account of the above investigation will shortly be submitted to the Chemical Society.

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¹ Shah and Laiwalla, *Current Science*, 197 (1936).

² Robinson and Shah, *J. Chem. Soc.*, 1494 (1934).

³ Baker, W., *J. Chem. Soc.*, 1684 (1934).

Long-distance Radio Reception and the E-Region of the Ionosphere

MR. ALEXANDER A. MCKENZIE, of the Mount Washington Observatory, has reported a well-marked case of the long-distance reception of amateur 56-60 megacycle signals, which occurs occasionally at this time of year. A letter from him reads in part: "We started listening about 1930 E.S.T. (June 5, 1938) and listened continuously until about 2045. During the whole time, long-distance signals were fading in and out fairly rapidly with extremely audible volume at the start, for instance, of a call letter group and absolute silence before the group was completed."

Mr. McKenzie, on Mount Washington, heard twelve Middle Western stations, and reports a supplementary list of seven other stations which were being called by various amateur stations in the New England area. With two exceptions which may be ascribed to faulty identification, the stations heard in New England appear to have been closely grouped about a point somewhat south of Chicago. The minimum and maximum distances involved are 780 and 960 miles, the mean being 880 miles.

Continuous records of the heights of reflections from the ionosphere are made at Cruft Laboratory at a frequency of 3.5 megacycles. On the night in question, remarkably strong abnormal E region reflections were observed from 1912 to 2035 E.S.T., the number of multiple reflections varying from four to six. At 2035 the reflection began to decrease in intensity, and it disappeared completely at 2050. The apparent height of reflection was 120 ± 3 km. throughout the period.