modification suggested by Pepinsky & Cochran (1951), should be useful. However, the amplitudes were so distributed that the latter modification failed entirely, and the equations relating the Fourier coefficients of the squared and unsquared density functions gave correct sign relationships only when the *full* set of coefficients was used in each equation. As a consequence, these methods were not useful at all in the early, critical stages.

The vector convergence density (VCD) method (Buerger, 1950; Beevers & Robertson, 1950) for interpretation of the Patterson diagram was first tried unsuccessfully. It was later discovered that a computational error (human, not machine!) was responsible for the failure. The *a*-axis projection was actually first solved by the very classical use of Bragg–Lipson charts and packing considerations. Subsequent application of the VCD method showed that this led directly to the correct projection on (100).

The *a*-axis projection is shown in Fig. 1, as photographed from X-RAC. The correctness ratio, $R = \Sigma|F_o - F_c| \div \Sigma|F_o|$, for this projection is 0·20. The structural formula is shown in Fig. 2.

A projection on (010) was computed in order to determine the *x* coordinates. All coordinate assignments to date are presented in Table 1. A full three-dimensional analysis is in progress and will be reported subsequently.

Table 1. *Coordinates for kojic acid*

	x	y	z
C_1	0·14	0·047	0·300
C_2	0·00	0·099	0·393
C_3	0·04	0·165	0·313
C_4	0·22	0·170	0·159
C_5	0·29	0·114	0·059
C_6	0·26	0·091	0·902
O_1	0·36	0·057	0·140
O_2	0·12	0·091	0·545
O_3	0·86	0·210	0·393
O_4	0·16	0·162	0·799

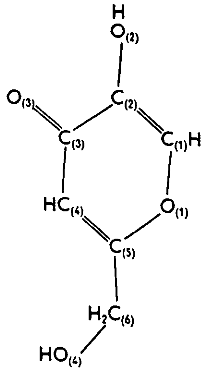

Fig. 2. Structural formula for kojic acid.

A projection on (010) is now in progress, to determine the *x* coordinates. Full details of the structure will be published upon completion of this phase of the analysis.

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The crystal structure of artinite, $Mg_2(OH)_2CO_3 . 3H_2O$.

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A trial structure of artinite has been derived from (*a*) unit-cell parameters (see below); (*b*) the presumed analogy to certain magnesium oxychlorides (de Wolff & Walter-Levy, to be published) involving infinite bands $\|b$ with a brucite structure; (*c*) the outstanding strength of the (203) reflexion, indicating the azimuth of the bands; (*d*) Heritsch's (1948) conclusion (optical) that CO_3 ions lie in planes $\|b$, and his value for their azimuth; (*e*) Fenoglio's (1942) conclusion from etching figures, that the space group is probably $C2$.

The value of F_c were compared with $|F_o|$ values of the 34 ($h0l$) reflexions with $(\sin\theta)/\lambda < 0{\cdot}32$, obtained from the photometer record of a powder pattern (sample kindly submitted by Dr de Jong, with $a = 16{\cdot}56$, $b = 3{\cdot}15$, $c = 6{\cdot}22$ Å, $\beta = 99° 9'$) and completed for some coincident reflexions by using Heritsch's qualitative single-crystal data. Slight parameter changes led to a satisfactory agreement. The final projection (Fig. 1, Table 1) shows the bands consisting of two rows of

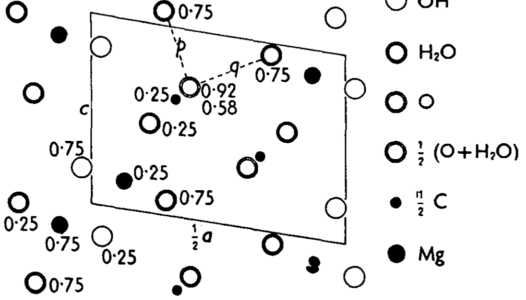

Fig. 1. (010) projection.

octahedra, sharing with CO_3 ions those oxygen atoms which have only one magnesium neighbour. The anions must have a repeat distance of $2b$, but the resulting reflexions with non-integral k are diffuse (Heritsch). This can now be understood as a consequence of the extremely weak correlation between the rows of anions; disorder within any single row seems improbable. The y coordinates in Table 1 refer to the *averaged* structure (space group $C2/m$), assuming minimum distortion of the octahedra and assuming right angles between the direction C–O$_I$ and [010]. The corresponding F_c values of 25 (hIl) reflexions agree reasonably with Heritsch's qualitative estimates. Further refinement has not been attempted because of the difficulties ensuing from overlapping in the averaged structure. The length of q (2·88 Å) as compared with p (2·65 Å) (Fig. 1) explains the perfect cleavage along (100) observed by Heritsch.

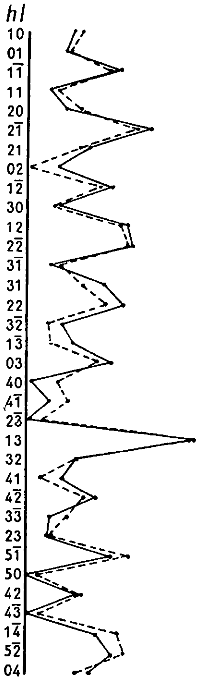

Fig. 2. Observed (full line) and calculated (broken line) values of $|F(h0l)|$.

Table 1. *Atomic positions in fractional coordinates*

	x	y	z
Mg	0·064	0·250	0·139
OH	−0·019	0·750	0·175
H_2O_{II}	0·146	0·750	0·067
$\frac{1}{2}(O_I+H_2O_I)$	0·114	0·250	0·466
$\frac{1}{2}O_{II}$	0·194	0·583	0·689
$\frac{1}{2}O_{II}$	0·194	−0·083	0·689
$\frac{1}{2}C$	0·167	0·250	0·611

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Physical constants of isotropic solids.

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Bhagavantam & Suryanarayana (1949) obtained the number n_i of physical constants for properties such as photo-elasticity, elasticity, piezo-electricity etc. in each of the 32 crystal classes. Jahn (1949) derived the same numbers by a different method and extended the results to isotropic solids and solids having complete rotational symmetry*. Jahn's results can be derived from group characters using the formula

$$n_i = \frac{1}{2\pi}\int_0^\pi (\chi'_+\chi_- + \chi'_-\chi_+)d\varphi ,$$

wher $\chi'_\pm$ stands for the character of the physical property and $\chi_\pm = 1 \pm \cos\varphi$, the upper sign holding for rotations, and the lower sign for rotation reflexions.

For example, in the case of elasticity,

$$\chi'_\pm = 16\cos^4\varphi \pm 8\cos^3\varphi - 4\cos^2\varphi + 1 ,$$

and

$$n_i = 2 .$$

Similarly, other constants for isotropic solids can be evaluated.

In the case of solids possessing only symmetry R_∞, the formula takes the form

$$n_i = \frac{1}{\pi}\int_0^\pi \chi'_+\chi_- d\varphi .$$

The results thus obtained agree in all cases with those of Jahn (1949, Table 1). The above formulae follow directly (Wigner, 1931, p. 167) from the orthogonality relations between the characters of the irreducible representations of the symmetry groups R^i_∞ and R_∞.

Our thanks are due to Dr H. Juretschke for his helpful suggestions on this paper.

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* The last heading R^i_∞ of Table 1 of Jahn's paper should be replaced by R_∞.

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