We have also observed these phenomena in other aromatic compounds, as well as in long-chain hydrocarbons and their derivatives. We therefore conclude

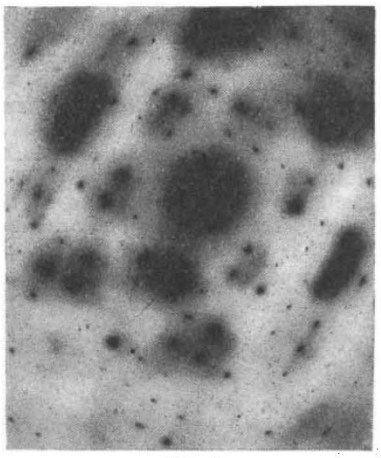

Fig. 2.
ANTHRACENE, SHOWING LAUE SPOT PATTERN, DIFFUSE MAXIMA AND EXTRA DIFFRACTIONS ELONGATED NORMAL TO THE LONG AXIS OF THE MOLECULE.

that the parallelism between the electron and X-ray diffraction phenomena also extends generally to the effects originating from thermal vibrations in crystals.

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Open Packing of Spheres

AT the present time when economy of material is so important, the problem of the open packing of spheres possesses more than theoretical interest. The most open (or least dense) packing is unknown[1]. A number of systems have been described by Heesch and Laves[2] including one with a density of 0·056, which may well be the most open possible under the conditions which they have imposed upon themselves. But if the object be to obtain a homogeneous structure with minimum density, in which each sphere makes contact with three others, and which shall be in equilibrium (though not necessarily in stable equilibrium), then, discarding the condition that the assemblage shall be of the single-parameter type, it is possible to proceed as follows:

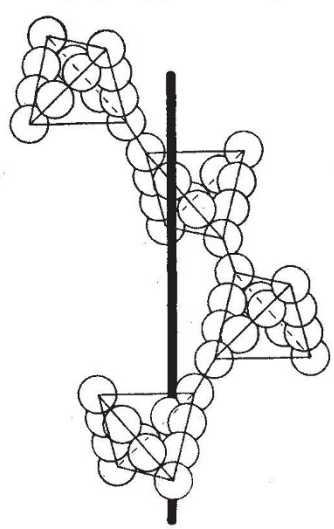

Fig. 1.

Take twelve equal spheres and arrange them in contact with their centres on four opposite edges of a regular tetrahedron. Take quantities of such tetrahedra and arrange them about a tetragonal screw-axis in such a way that a face of a tetrahedron is co-planar with a face of each adjacent tetrahedron, a plane of symmetry perpendicular to these faces being common to the two adjacent tetrahedra (Fig. 1). By extending the process systematically a series of tetragonal screws is developed, alternately right- and left-handed. Part of this tetragonal assemblage as seen from above is shown in Fig. 2. It has a density of 0·042.

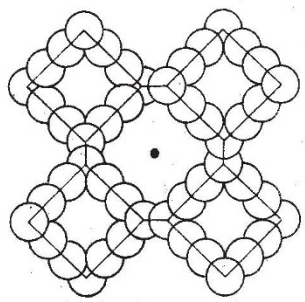

Fig. 2.

The study of a model of the lines of centres of the spheres in this structure, considered as a system of girders, may perhaps commend itself to engineers.

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'Firmness' in Compression and Tension

ATTENTION was directed some time ago[1] to the applicability of Scott-Blair's equation, $\psi = s^{\beta}\sigma^{-1}tk$ (s is shearing stress, σ is strain, t is time, ψ is firmness, k and β are constants) for the 'firmness' of soft materials[2] to tests in tension as well as to tests in compression. This applicability was later extended to tests in torsion[3]. Some actual experimental figures were published showing the comparison between tension and torsion tests results, but no figures have been given for comparative tension and compression tests. These were omitted as no good agreement was obtained, apparently indicating the existence of experimental errors. It is now believed, however, that the apparent anomalies are due to a fundamental cause and not to experimental error.

	Bitumen 2	Bitumen 4	Bitumen 6
k: extension	0·47	0·82	0·89
compression ...	—	0·70	0·74
torsion	0·48	0·85	0·82
log ψ: extension	8·0	6·3	7·1
compression ...	—	6·2	6·6
torsion	7·9	6·6	6·9

A few typical results are given in the accompanying table, whence it is seen that the values for both k and log ψ are higher for tests in tension than in compression. Torsion tests give values not precisely