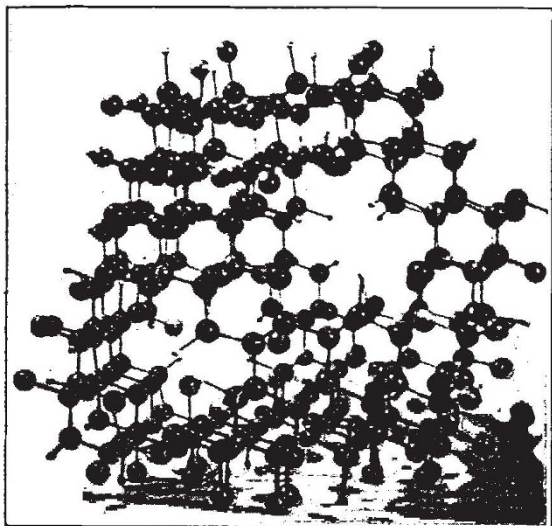


The Tuberculin Protein TBU-Bovine (523)¹

As has been increasingly emphasized lately, the fundamental problem of protein structure is to explain the existence of very large but chemically and physically well-defined molecules. It is evident that any two-dimensional pattern of amino-acid residues will either be incapable of folding to form a closed cage-like structure, or will form such a structure only in certain ways which correspond to definite numbers of residues. Irrespective of the particular nature of the characteristic protein fabric, the idea of closed structures (such as a cage² or torus or surfaces of higher connectivity) has therefore been offered as an explanation of the existence of these protein megamolecules.



The particular fabric known as the cyclol fabric has been shown to yield cage structures C_1, C_2, \dots the skeletons of which are built on a ground plan of 72, 288, \dots residues, and it has already been shown that the actual numbers given by Svedberg for his molecular weight classes correspond to simple or compound C_1, C_2, \dots units or to colonies of C_1 units alone³. As was pointed out, the smallest of these classes corresponds to a dimeric structure made up of two C_1 cages. It is therefore of interest to find that, in studies of the tuberculin protein molecules, a protein, TBU-Bovine (523), with molecular weight about 10,000, has been isolated, which is homogeneous in sedimentation, diffusion and electrophoresis. Such a molecular weight is of the right order of magnitude to correspond to a single C_1 structure.

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¹ Seibert, Pedersen and Tiselius, *J. Exper. Med.*, **68**, 413 (1933).

² Wrinch, Cold Spring Harbor Symposium on Proteins, **6** (1935).

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Structure of Aromatic Polynitro Compound - Hydrocarbon Complexes

THE most obvious evidence of interaction of some kind between aromatic polynitro compounds and other aromatic substances is the isolation of many crystalline compounds containing the two

components in simple molecular proportions. The evidence, particularly of colour and heat of interaction, points to something stronger than mere van der Waals' binding between the molecules, but it is not certain that they are linked by ordinary valency bonds. Existing X-ray work¹ and the theoretical work of Briegleb² are against this type of bonding.

We have examined the crystal structures of a large number of these compounds and find that, although the molecules are arranged in parallel planes, there are usually at least two sets of planes inclined to each other, and owing to overlapping of many atoms in projections of the structures, a clear decision as to the exact position is difficult. We have now, however, found a structure in which this difficulty is removed and a convincing proof provided that there are no bonds between the molecules.

The 1:1 molecular compound of picryl chloride and hexamethylbenzene is orthorhombic: $a = 14.0$, $b = 9.0$, $c = 15.4$, and the space group *Amam* or *Ama*. There is no pyro-electric effect detectable by the liquid air method; the crystals therefore probably have a symmetry centre (space group *Amam*), but the conclusions we draw are valid for both space groups. Patterson analyses and general space group considerations show that all picryl chloride molecules lie in two sets of planes parallel to (100) separated by a distance of 7 Å. All hexamethylbenzene molecules lie in two sets of planes parallel to and half-way between these, that is, separated from them by 3.5 Å. This is supported by optical properties and by quantitative agreement of calculated and observed relative intensities of reflections $h00$. In this special case there cannot be any valency bonds between the nitro compound and the hydrocarbon whatever the arrangement of the molecules in their own planes. Anomalous X-ray diffraction effects suggest the possibility of a cell of three times the b dimension and show that there is some degree of disorder in the structure. Comparison with the corresponding bromide and iodide shows that it is the nitro molecules that are disordered. Of particular significance is the fact that the structure of the hexamethylbenzene layers is identical to within fractions of an angstrom unit with that of a single layer in the crystal of hexamethylbenzene itself.

A more detailed account of this work will be published elsewhere.

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Classical Dynamics of the Meson

THE interaction energy between two nuclear particles in the case of interaction transfer by single Bose particles, that is, $g^2 e^{-K_0 r}/r$, can be obtained either by identifying it classically with the Green's function of, for example, $\Delta \varphi - K_0^2 \varphi = 0$ ($K_0 = mc/\hbar$) for the field of mesons transferring the interaction, or by a computation on the lines of quantum electrodynamics. The latter method leads to the same