The function $P(w)$ can also be used to calculate the R-value which is to be expected when a part of the structure (for example, the heavy atoms alone) is used for calculating the F_c's. This follows from the relation:

$$R = \frac{\Sigma||F_N| - |F_P||}{\Sigma|F_N|} = \frac{\int_{-\infty}^{+\infty} |w|P(w)\mathrm{d}w}{\int_{-\infty}^{+\infty} yP(y)\mathrm{d}y}$$

where $P(y)$ is the distribution function for a single crystal (centrosymmetric, or non-centrosymmetric, as the case may be), and is known. A table of R as a function of σ_1^2 has been calculated for both the related and unrelated cases, and this has been found to be useful in checking whether the positions of the heavy atoms determined are correct or not.

By calculating from $P(w)$ the integral $P_+ = \int_0^\infty P(w)\mathrm{d}w$, that is, the fraction of reflexions for which w is positive, it is possible to put the intensity data of two isomorphous crystals on the same relative scale. The details are omitted.

Thus, these statistical methods are found to have a number of applications to the study of isomorphous crystals. However, it may be mentioned that the foregoing results correspond only to the type of isomorphism in which a small number of atoms are *added* to a crystal. The extension of these studies to the case when the isomorphism is of the replacement type is possible and is under investigation.

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Crystallographic Data of Two Seleno-urea Derivatives

As part of an investigation of the crystal structure of several derivatives of seleno-urea and a metal (palladium) the unit cell and space groups of α-benzoyl β-phenyl seleno-urea and α-acetyl β-phenyl seleno-urea have been determined.

(*a*) *α-benzoyl β-phenyl seleno-urea.* Rotation and Weissenberg photographs, taken with copper $K\alpha$ radiation, showed that the unit cell is monoclinic with the dimensions: $a = 19{\cdot}97 \pm 0{\cdot}03$, $b = 5{\cdot}11 \pm 0{\cdot}03$, $c = 13{\cdot}15 \pm 0{\cdot}03$ Å, $\beta = 104{\cdot}0 \pm 0{\cdot}3°$.

The space group is $P2/c$. The observed density was 1·6 g/cm³ in agreement with the calculated value 1·54 g/cm³ corresponding to four molecules of α-benzoyl β-phenyl seleno-urea per unit cell. The absorption coefficient gave $\mu = 41{\cdot}8$ cm^{-1}.

(*b*) *α-acetyl β-phenyl seleno-urea.* Crystals are monoclinic with the dimensions: $a = 10{\cdot}26 \pm 0{\cdot}03$, $b = 22{\cdot}43 \pm 0{\cdot}03$, $c = 9{\cdot}36 \pm 0{\cdot}03$ Å, $\beta = 113{\cdot}0 \pm 0{\cdot}5°$, deduced from rotation and Weissenberg photographs. Copper $K\alpha$-radiation was used. The systematic absences are $0k0$ for k odd and $h0l$ for l odd, so that the space group is determined as $P2_1/c$. The density measured by flotation is 1·7 g/cm³. The calculated value for eight molecules per unit cell gives 1·69 g/cm³. The absorption coefficient for copper $K\alpha$-radiation is 3·6 cm^{-1}.

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CHEMISTRY

Detergent (Sodium Lauryl Sulphate)-splitting Enzyme from Bacteria

The persistence of synthetic detergent compounds in treated sewage effluents and rural water supplies has become an increasing problem[1]. Several investigations have been carried out, using methylene blue colorimetric and manometric techniques, of the bio-degradation of these materials by the mixed bacterial flora in sewage and river water[2]. Payne and Feisal[3] succeeded in isolating from benthonic soils two strains of bacteria, of which one could utilize lauryl sulphate and the other both lauryl sulphate and alkyl benzenesulphonate as sole carbon sources. Investigation of detergent metabolism at the enzyme-level has not yet been reported.

Alkyl benzene sulphonates constitute the major class of detergent in use for household purposes and, therefore, play the greatest part in water pollution problems. However, examination of the enzymatic degradation of these compounds is complicated by the enormous number of isomers to be considered. On the other hand, alkyl sulphates are easily obtained in high purity without cross-contamination of isomers, inorganic sulphate, or other inorganic substances. By examining the mode of action of alkyl sulphate-destroying enzymes as a model, clues might be obtained to facilitate investigation of enzyme action on alkyl benzene sulphonates. Because it is well known that detergents denature proteins, one wonders how a detergent-destroying enzyme could escape denaturation. The investigation recorded here was initiated with these problems in mind.

With synthetic minimal media containing sodium dodecyl sulphate (SDS) as both carbon and sulphur source, a gram-negative bacillus was isolated from raw sewage water of the Baltimore Back River Sewage Treatment Plant. (As proposed by Schwatz and Pewey, the term 'dodecyl' will be reserved for the true C_{12} radical, and the term 'lauryl' for the mixed aliphatic radicals (mainly C_{12} and C_{14}) derived from coconut oil (*Surface Active Agent*, Interscience Publishers, Inc., New York, 1949).) This strain could also utilize octyl, decyl, tetradecyl sulphate instead of dodecyl sulphate. (This series of alkyl sulphate was kindly supplied by Dr. R. C. Johnson of E. I. DuPont DeNemours and Co.)

Detergent utilization was assayed by non-polar complex formation of detergent with methylene blue via chloroform extraction[4]. As a product of enzyme activity, sulphate was measured with barium chloranilate[5].

Bacteria were grown at 37° C in the synthetic medium with sodium dodecyl sulphate as sole carbon and sulphur source. The cells were collected by centrifugation, washed with 0·14 M sodium chloride solution and disrupted in a French pressure cell[6]. All the detergent-splitting activity remained in the ultra-centrifugal supernatant (110,000*g* for 90 min) and was not lost after dialysis. The enzyme preparation from cells adapted to SDS released sulphate from decyl- and tetradecyl-sulphate as well as SDS. That the enzyme (or enzymes) is formed adaptively is suggested by the observation that the same strain grown with citrate as carbon source did not yield preparations with these detergent-splitting activities. The same conclusion was reached in manometric assays using non-growing cells.

With SDS as substrate, the crude enzyme preparation consumed only 0·6 μM oxygen during the release of 11·6 μM sulphate. This suggests that oxygen does not participate in the release of sulphate and that the enzyme action is the hydrolysis of the sulphate ester linkage; the other product of this type of reaction would be dodecyl alcohol.

When the concentration of SDS exceeded $6{\cdot}7 \times 10^{-3}$ M, enzyme activity was lost. However, addition of bovine serum albumin permitted active hydrolysis of SDS at

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