thus provides information about irregularities similar to that provided by the classical methods about regular structures.

Fig. 3 shows that the shadow lines are not confined to the Bragg reflexion spots but often can be followed far into the background. (These straight lines in the background must not be confused with the concentric circles which are a trivial consequence of the rotation of the grid about the central spot.) Consequently, a large proportion of the background in the surroundings of a spot had been reflected simultaneously with the spot. This opens up the possibility of analysing the origin of the background in terms of contributions from individual atomic planes. Part at least of the structure of the background would seem to be due to the 'diffuse' ('dynamic') reflexion of X-rays, caused by the thermal vibration of atomic planes. In a system of shadow lines extending from a Bragg reflexion spot into the background, the dark stripes are produced by the total radiation coming from the crystal, while in the light stripes the radiation contributed by the lattice plane of the Bragg reflexion is screened off. Thus the difference of the intensities represented by the dark and the light stripes at two neighbouring points is the intensity diffracted by the lattice plane of the adjacent Bragg reflexion. This provides a means of quantitative measurements of the diffuse reflexion from individual lattice planes. The photograph Fig. 3, taken at room temperature, shows that the method can be used even at low temperatures, if, by a suitable choice of the radiation, the glancing angle of the lattice plane is brought sufficiently near to 90°.

Another possible use of the new method is for obtaining information about the mosaic imperfections of crystals. If the speed of rotation of the grid, but not that of the crystal, is increased, the contours of the shadow lines must become blurred as the transverse movement of the wires during the time of reflexion begins to be noticeable. If the primary beam is collimated by a perfect-crystal monochromator, this effect should give a direct measure for the X-ray imperfection of the crystal.

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Nitrogenous Character of Penicillin

PENICILLIN purified as described by Abraham and Chain[1] contains nitrogen. The interpretation of low positive results in the Dumas analysis of less pure material was made uncertain by the failure to respond to the usual qualitative test and by low results in Kjeldahl estimations. However, traces of pyridine have been recognized, by the characteristic absorption spectrum, as a product of the action of boiling concentrated sulphuric acid on the purest material. With this material the Kjeldahl method, under vigorous conditions, gave the same result as the Dumas. The barium salt, dried at 100° *in vacuo* over phosphoric anhydride (no further loss at 120°), contains (Weiler and Strauss): C, 44·3; H, 4·85; N, 4·13 (Dumas), 4·2 (independent micro-Kjeldahl); C-Me, 11·6; Ba, 22·0 per cent (independent estimation 21·3). There was no phosphorus or sulphur, and no O-Me or N-Me groups. These results are in fair agreement with the formula $C_{24}H_{32}O_{10}N_2Ba$. This is provisional, and C_{23} and C_{25} formulæ are not excluded. The barium salt is strongly lævorotatory in aqueous solution. The absorption spectrum does not suggest that aromatic rings are present in the molecule. Hydrolysis affords one carbon dioxide molecule and other products, including a water-soluble volatile acid, and a substance giving a sparingly soluble picrolonate, flavianate and aurichloride.

While it is possible that the above observations hold for pure penicillin, we cannot definitely claim homogeneity of the material in the absence of the usual criteria of purity.

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[1] NATURE, **149**, 328 (1942) and paper in the press.

Bactericidal Effects of *Aspergillus clavatus*

IN preparing enzyme concentrates from certain moulds, antibacterial activity was noted in material from a number of species characterized by high proteolytic capacity. Thus two strains of *Aspergillus clavatus* were found to be capable of sterilizing liquid media which had been infected with *Staphylococcus aureus* and other organisms. These moulds invest simple liquid media such as Csapek Dox solution with distinct antibacterial properties. Small portions of the medium on which the mould has been grown inhibit the growth of *Staphylococcus aureus* in glucose broth and other media. Larger quantities of medium are bactericidal, no viable organisms being demonstrable after the mixture of broth and medium has been incubated for several hours. In intermediate dilutions an initial phase of bacteriostasis may be followed by bactericidal action. The active substance differs from penicillin not only by being bactericidal as well as bacteriostatic, but also in several other respects. First it is relatively stable; filtrates may be handled without sterile precautions, and even high acidity is well tolerated. Aqueous solutions may be boiled without being inactivated. Furthermore, the substance inhibits the growth of, and in higher concentrates kills, a number of organisms that are not attacked by penicillin.

Concentrates of the active substance are obtained by absorbing it on charcoal directly from the liquid medium after removal of the mycelium, and by afterwards eluting the dried charcoal with ether. The ether-soluble fraction shows bactericidal potency in dilutions of 10^{-5}. Occasionally more potent fractions were obtained.

Antibacterial activity is also demonstrable in presence of serum, pus and urine. The medium and active concentrates thereof were administered without adverse effect to mice, to healthy human subjects and to a number of clinical cases. The protective effect *in vivo* remains to be studied in greater detail, but it appears that the active fraction inhibits strains of organisms which proved resistant to such agents as sulphonamides or mandelic acid.