

Broadening of the X-ray Diffraction Lines in Teeth affected by Fluorine

THE diffraction of X-rays in the case of teeth can be investigated by a modification of the standard X-ray powder method, by producing biophysical specimens in the form of wires of tooth material by the careful cutting and filing of suitable pieces of tooth material. A 9 cm. camera of the Van Arkel type with filtered copper radiation has been used in comparing the diffraction lines from two specimens of teeth (one from a male and one from a female) which had been extracted following decay.

One of the teeth described had been surface-treated by a fluorine dental treatment approximately eight years previously, while the natural age of both teeth was similar. Cutting and filing was carried out so as to produce specimens of identical sizes, and such that one side in each case consisted of undamaged enamel: the resulting diffraction photographs are shown in Fig. 1 and it is seen that apart from the progressive broadening and blurring of higher-order lines in one photograph (from the specimen affected by fluorine, a), the patterns are identical.



Fig. 1

The positions of the strongest lower-order diffractions were found to correspond with the hexagonal apatite form of crystal structure^{1,2}. Since the teeth in their natural life must have experienced appreciable mechanical force and work of deformation, it is considered that a suggestion for the line-broadening based on normal stress/strain or grain size is less satisfactory than one arrived at by considering the variation of the surface composition within the cell-dimension limits of fluoro-apatite and chloro-apatite. This X-ray effect in hexagonal crystals has been previously described by one of us³.

We are grateful to the Chemistry Department of the University of Sheffield for making available X-ray facilities.

E. A. SCOTT
F. H. SCOTT

5 Heather Lea Avenue,
Dore,
Sheffield.

¹ Náray-Szabo, St. v., *Z. Krist.*, **75**, 387 (1930).

² Hendricks, S. B., et al., *Z. Krist.*, **81**, 352 (1932).

³ Scott, F. H., *Cah. Phys.*, **86**, 381 (1957).

BIOLOGY

Triple Coitus in the Mealy Bug, *Planococcus citri* (Risso)

MALES of the mealy bug, *Planococcus citri*, do not feed throughout their nymphal stages of development nor after they emerge as adults. They are, nevertheless, highly active in mating during the few days of their short life as mature individuals. James¹ has observed that a single male may copulate with as many as 23 females in succession, and the average number of females fertilized by 13 individual males was 9.07. During my experience with mealy bugs cultured in the laboratory on potato, the observation has been made many times that two males will copulate simultaneously with one female while yet a third male may be attempting to do the same.

The fully winged males are quite sedentary, seldom fly, but crawl about on the potato in search of mature females. During the mating process, the females usually remain in the same spot at which they had previously settled in order to feed. It has not yet been possible to tell why a certain female in a group of equally old females attracts the males nor is it known how long after one mating the female remains attractive to males.

Simultaneous unions of two males with one female can be accomplished because of their relatively long abdomina. Usually the two males align themselves on the dorsal surface of the female; the abdomina and copulatory stylets then curve ventrally around the posterior limits of the female and both copulatory stylets and phalli penetrate the single vulva to the same extent. Both insertions are maintained by the males through considerable disturbance with a camel-hair brush, as is the case in pair matings. It is very likely, on the basis of this observation, that both copulations are genuine and that both mating acts are complete.

WALTER A. NELSON-REES

Genetics Department,
University of California,
Berkeley 4. Dec. 4.

¹ James, H. C., *Bull. Ent. Res.*, **28**, 429 (1937).

Behaviour of Sacculinized Shore Crabs (*Carcinus maenas* Pennant)

For some years investigations on the ecology of the common shore crab, *Carcinus maenas*, have been carried out in inshore Danish waters (the Isefjord area, Zealand) and among other things the migrations of the species were studied. In contrast to the observations from British waters of Williamson¹ and others, it was observed that during the breeding season—which in the Isefjord comprises only May and June—the berried female crabs leave the littoral areas and hide in the more saline and deeper water (maximum depth 8–10 metres) until the larvæ are hatched. After this period they return to moult and copulate with the male crabs which stay all summer in shallow water (0–1.5 metres). The annual mean salinity of the Isefjord is 19.4 per mille.

It has now been found that sacculinized crabs (that is, both male and female crabs subjected to parasitic castration by *Sacculina*) carrying an externa (containing the gonads of the parasite) behave just like the normal berried females, that is, they hide in deep water. This seems to be normal for 'externa