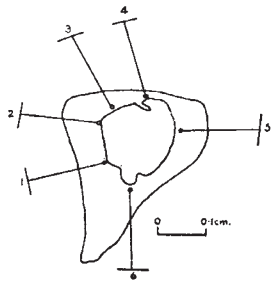

Fig. 1

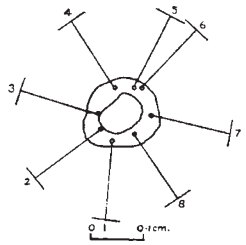

Fig. 2

Fig. 1. Outline of cross-section of rat femur (age 4 months) showing positions where X-ray diffraction photographs were taken and corresponding directions of preferred orientation of *c*-axes of apatite crystals

Fig. 2. As for Fig. 1 (age 10 days)

preferred orientation is tangential, these angles should be 90°.

Two examples are illustrated. Fig. 1 is a section of a femur of an adult rat (four months) and the angles are respectively as follow:

(1) 90°, (2) 79°, (3) 87°, (4) 83°, (5) 85°, (6) 87°.

Fig. 2 is a section of the femur of a young rat (ten days) and the angles in this case are:

(1) 87°, (2) 88°, (3) 89°, (4) 88°, (5) 90°, (6) 86°, (7) 87°, (8) 89°.

In view of the difficulty of drawing accurate tangents to the non-regular surfaces, it seems well established that the apatite crystals in the cross-section of the rat femora are preferentially orientated with the *c*-axis tangential to the surface of the bone.

When photographs of a longitudinal section are compared with those of a cross-section, it is clear that the intensity of the 002 arcs in the latter is much less than in the former. It seems, therefore, that in the bone shaft as a whole the majority of crystals are arranged with their *c*-axes approximately parallel to the long axis of the bone; but of those crystals which are lying with their *c*-axes in the cross-sectional plane, most are arranged with the *c*-axes tangential to the surface. Fig. 3 shows X-ray diffraction photographs of (*a*) a longitudinal section with X-ray beam perpendicular to the long axis, (*b*) a cross-section of the same specimen with X-ray beam parallel to the long axis of the bone (position No. 3 of Fig. 1); copper $K\alpha$ radiation, specimen-to-film distance 1 cm. The 002 reflexion which shows pronounced arcs in both photographs is inside the strong continuous ring.

We are indebted to Prof. A. Haddow, of the Chester Beatty Research Institute, London, for a supply of pure-line Wistar rats and to Prof. G. H. Bell and Miss M. H. Thomas for providing us with most of the specimens.

Sheena M. Clark
John Iball*

Carnegie Laboratory of Physics
(University of St. Andrews),
University College,
Dundee.
June 3.

* British Empire Cancer Campaign Research Fellow.

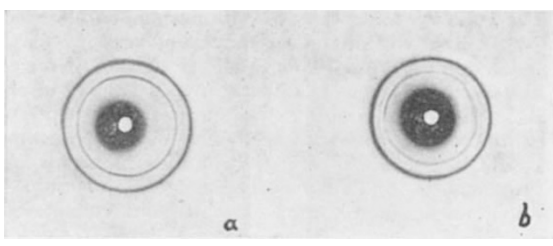

Fig. 3. X-ray diagrams of (*a*) longitudinal section of rat femur, (*b*) cross-section of same femur

[1] Clark, J. H., *Amer. J. Physiol.*, **98**, 328 (1932). Clark, G. L., and Mogudich, J. N., *Amer. J. Physiol.*, **108**, 74 (1934). Henny, G. C., and Spiegel-Adolf, M., *Amer. J. Physiol.*, **144**, 632 (1945). Engstrom, A., and Zetterstrom, R., *Exp. Cell Research*, **2**, 268 (1951).
[2] Atkinson, H. F., *Brit. Dent. J.*, **88**, 29 (1950).
[3] Chesley, F. C., *Rev. Sci. Instr.*, **18**, 422 (1947).

Fluorometric Detection and Estimation of Germanium

Fluorometry has become a very important tool in the hands of the analytical chemist in recent years not only for the detection but also for the quantitative estimation of several substances, especially those occurring in traces. Nevertheless, very few metals are detected and estimated by fluorometric methods.

No fluorometric test has so far been reported for germanium. This element has in recent years attained strategic importance on account of its use in the manufacture of transistors and on account of its scarcity. We have now found that traces of germanium give an intense greenish-yellow fluorescence with a solution of resacetophenone in concentrated sulphuric acid or syrupy phosphoric acid under filtered ultra-violet light. No other metal interferes.

Borate gives a blue fluorescence with this reagent, as already reported by Neelakantam and Row[1]. Nitrite, nitrate, fluoride and chromate quench the fluorescence given by germanium in both the sulphuric and phosphoric acid media. Bromide, iodide and chlorate quench the fluorescence in the sulphuric acid medium but not in the phosphoric acid medium. When sulphuric acid is employed, the solution acquires a brownish colour, which deepens on standing.

We recommend the following method for the fluorescence test for germanium. The resacetophenone reagent is prepared by dissolving 0·5–1·0 gm. of the pure substance in 100 ml. of acetic acid. To 3 ml. of this reagent in a quartz test-tube is added 6 ml. of syrupy phosphoric acid. 0·1–1·0 ml. of the germanium solution is now run in and mixed, adding some more syrupy phosphoric acid, if necessary, to make up the total volume to 10 ml. Then the test-tube is kept exposed to ultra-violet light from which all visible light has been filtered out; for this purpose we have used the 'Cenco Black Light' source operating on 220-V. a.c. mains. The intensity of the greenish-yellow fluorescence has been found to vary with the concentration of the germanium ions. The limit of sensitivity is 1 : 10,000 and the limit of identification 100 γ.

N. Appala Raju
G. Gopala Rao

Department of Chemistry,
Andhra University,
Waltair, India.
April 21.

[1] Neelakantam and Row, L. R. *Ind. Acad. Sci.*, **16**, 349 (1942).