

approaching the number so far known for *P. annectens*. Furthermore, the locality for the Quelimane specimen (see map) appears very isolated from the other recorded localities of *P. amphibius*.

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<sup>1</sup> Trewavas, E., *Ann. Mus. Congo, Tervuren, Zool.*, 1, Misc. Zool. H. Schouteden, 83 (1954).

<sup>2</sup> Peters, W., "Reise nach Mossambique, Zool.", 4, 3 (1868).

<sup>3</sup> Schneider, A., *Zool. Anz. Leipzig*, 9, 521 (1886); *Zool. Beitrag. Breslau*, 2, 97 (1887).

### Representation of the X Chromosome in Intermitotic Nuclei in Man

It is generally supposed<sup>1</sup> that there is a close relationship between the sex chromosomes and the nucleoli in most species, though the evidence for this in mammals is scanty<sup>2</sup>. It is nearly certain that the sex chromatin body<sup>3</sup> found in most nuclei in females of some species, including man, represents the heterochromatin of the X chromosome pair<sup>4</sup>. The demonstration of a persistent connexion between these bodies in some nuclei may serve to support both hypotheses. Reitalu<sup>5</sup> has described such a connexion in human foetal liver; the matter seems important enough to justify this further description, based on observations, made in ignorance of Reitalu's, of similar structures seen elsewhere.

Thyroid tissue cultures offer exceptionally favourable material for the study of nuclear detail. We have used the primary outgrowths from fragments of human thyroid removed at operation, attaching the fragments to coverslips with plasma clot. In such preparations mitoses are rare, and most of the cells seen appear to be epithelial migrants from the original explant. Sex chromatin may be seen in as many as 90 per cent of nuclei. The nucleolar chromocentres are large and variable in number as well as size, though two is the commonest number. A well-defined strand of chromatin joining the sex chromatin to these chromocentres (Figs. 1, 2) is seen in perhaps 1 per cent of the cells. It is usually sinuous in its course and may bear one or two small chromatin granules; we have not been able to satisfy ourselves that it is clearly double in the manner of Reitalu's drawings. It is demonstrable only with difficulty in other material, but Fig. 3 shows a very clear example in a decidual cell from an abortion. Klinger's<sup>6</sup> illustrations (especially his Fig. 7) suggest that similar threads might be demonstrated in human amnion or chorion.

Reitalu describes this strand as a euchromatin thread joining two heterochromatin bodies. The heterochromatin of the sex chromatin must lie in the unpaired segment of the X chromosomes. We have failed to demonstrate any sex difference in the nucleolar chromocentres in several tissues, and conclude that they probably represent heterochromatin of the

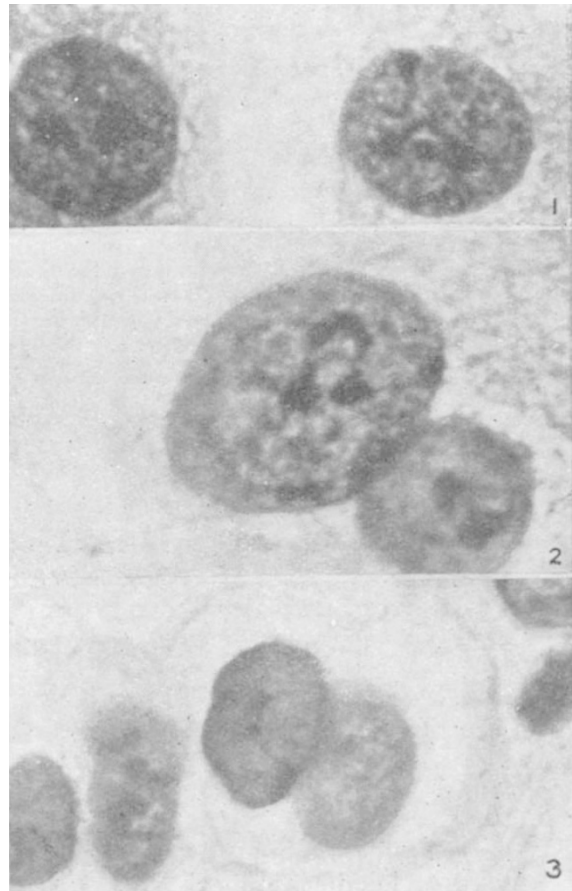


Fig. 1. Two nuclei from a thyroid tissue culture (female). On the left, the euchromatin thread is seen as a thick relatively ill-defined strand running down and to the right from the sex chromatin (at 12 o'clock) to join the right hand of the two nucleolar chromocentres. On the right, the euchromatin thread is very well defined, though its last part is out of focus: it runs from the sex chromatin (at 12 o'clock) to the left hand of the three nucleolar chromocentres. (Cresyl echt violet,  $\times 2,000$ )

Fig. 2. An unusually fine and well-defined euchromatin thread, running from the sex chromatin (at 3 o'clock) straight to the nearest of the three nucleolar chromocentres. (Feulgen,  $\times 2,000$ )

Fig. 3. Decidua from an abortion. A well-defined euchromatin thread running from the sex chromatin (at 4 o'clock on the nucleus of the central cell) to the nearest chromocentre. (Feulgen,  $\times 2,000$ )

paired segment. These three linked structures must therefore represent a substantial part of the X chromosome, visible in the resting nucleus.

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<sup>1</sup> Gates, R. R., *Bot. Rev.*, 8, 337 (1942).

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<sup>5</sup> Reitalu, J., *Acta Genet. med. Gemell.*, 6, 393 (1957).

<sup>6</sup> Klinger, H. P., *Exp. Cell. Res.*, 14, 207 (1957).