I. Introduction.

The existence of a gradient in the chromosomes of rye was revealed by a detailed chromomere analysis, made at pachytene, of the chromosomes of this species. This detailed chromomere analysis included the study of the number, size and distribution of the chromomeres of each chromosome, thus permitting the construction of a map of each chromosome type (LIMA-DE-FARIA, 1952b).

In the chromosomes of the normal complement of rye the chromomeres are particularly large on both sides of the kinetochore. There
is a subsequent general decrease in chromomere size on both sides of the kinetochore towards the chromosome ends, where in most cases an abrupt increase in chromomere size takes place (knob formations). This gradient in chromomere size is present in every chromosome of the normal complement of the species.

Moreover, it was found that the rate at which this decrease in chromomere size takes place in every arm bears a definite relation to arm length and to the position of knob formations, the general chromosome pattern appearing to depend on the properties of kinetochores, knob formations, and other specialized regions of the chromosome body (Lima-de-Faria, 1952a and b).

Such an analysis led to the conclusion that the size of a chromomere is determined not only by its genetic constitution and nuclear environment, but is also apparently dependent on its position within the chromosome. Experimental evidence of such a phenomenon is also available. Similarly, heteropycnosis appears as a phenomenon determined not only by the genetic constitution and nuclear environment of a certain chromosome region but also by the position of this same chromosome region within the chromosome body.

To obtain more information concerning these findings the present investigation was carried out.

II. Material and technique.

Anthers of Agapanthus umbellatus were fixed in acetic-alcohol 1:4 for 4—6 hours, transferred to 95% alcohol, where they were left over night, being stored after this time in 70% alcohol. The preparations were made after a few days according to the squash technique used for pachytene chromosomes of rye (Lima-de-Faria, 1948 and 1952b). After staining in iron-aceto-carmine and dehydrating in the usual way, the material was mounted in Canada balsam. This was the procedure used in the study of the second division of meiosis. When the material was used for pachytene studies it was worked out in the same way with the exception that, in this case, no previous fixation in acetic-alcohol was made. The buds were removed from the inflorescence, and an anther was immediately placed in a drop of iron-aceto-carmine. For the study of mitosis, root tips of well growing plants were treated with a 0.003 mol/l solution of oxyquinoline during six hours according to the technique of Tjio and Levan (1950). The root tips were fixed and stained with aceto-orcein, and after squashing, the slides were made permanent in the same way as the other preparations. I am indebted to Dr. S. Bose for making the preparations of root tip mitosis.

III. Observations.

1. Structure of the chromosomes at middle prophase II.

The prophase of the second division of meiosis is a relatively long and distinct stage in Agapanthus umbellatus. At interphase the chromosomes are not fully individualized, and pro-chromosomes may be observed...