a great measure dispose of the origin of the middle great division.

Now whether the great series of deposits immediately overlying the marine beds—the Yegua clays—have been altogether derived from the erosion and consequent destruction of the marine beds is not very clear. That a portion of the materials composing these clays was so derived there can be no doubt. The line of contact between the two is very irregular in more than one place, showing long troughs or valleys of erosion in the older beds, and now filled up by the clays and sands of the newer. At other places this outline shows the existence of comparatively bold head-lands, from which no doubt the waters of Yegua time abstracted a considerable quantity of material. The presence of extensive deposits of lignites in these beds would appear to indicate another source of material having a swamp or lagoon origin, and some of it may have been obtained from the rivers traversing the region. Some of the materials employed in the formation of these beds may also have been derived from the sea water occupying the area during the period of deposition.

The last division, or more properly speaking, the second division—the lignitic beds—presents somewhat different features from any of the others. So far as it contains immense deposits of lignite and small beds of sand carrying crystals of selenite, it resembles the Yegua clays, but with that its resemblance ceases. The beds belonging to this division overlie the basal deposits, which in many places they overlap so completely as to obscure them altogether, and in others lie in direct contact with the Cretaceous deposits. Throughout the whole of the immense thickness and extent of these beds, with the exception of a few fragmentary plant remains, some of them belonging to the *sabal* family, not a single fossil is known from this division. Evidently the conditions were not favorable to animal life.

These beds apparently represent a period when the whole coast was made up of swamps, lagoons and bayous, very similar to some portions of the gulf coast of the present day, or what may be seen in the broad stretches of overflow or "bottom" land found along almost every one of our rivers. A rank vegetation grew on the marshy portions, and the rivers of the time having no fixed channels, distributed their waters throughout the lagoons and bayous and into them, and over the low islands carried their burdens of debris during periods of flood. With this debris came soft clay, sand, branches, limbs and trunks of large trees, all of which went to swell the accumulations already gathering and aid in the formation or the lignites and their associated beds of clay and sand. In the meantime the coast was slowly sinking and the encroaching water eating away the basal clays and the Cretaceous deposits within reach.

The lithological structure of these deposits accord with these conditions. Everywhere the deposits are irregular in deposition, variable in texture, changing from fine-grained, dense, muddy, to coarse-grained, sandy material within short distances. Many of the beds contain great quantities of iron pyrites, a common characteristic of the Cretaceous greensand marls. In composition these lignitic beds closely resemble these marls.

	IV. Av. of 38 analyses of lignitic clays.	V. Cretaceous greensand marls.
Silica,	69.83	60.82
Alumina,	16.93	16.05
Iron,	3.66	5.25
Lime,	0.77	3.66
Magnesia,	0.35	
Potash,	1.35	1.75
Soda,	3.42	2.94
Sulphuric acid.	0.22	1.06
Carbonic acid,		2.85
Water and loss,	4.26	5.53
	100.79	99.91

From this, then, it would appear that while the greater portions of these clays and sands are derived from Cretaceous materials, these have been mixed with a small quantity of ingredients belonging to some of the older formations through which the larger rivers ran; but the proportions of these older materials were so small as not to visibly affect the deposits as a whole.

Mention has been made of the syenitic rocks of Arkansas and the basaltic outbreaks extending through the Texas Cretaceous area as forming the source of some of the materials found in the clays. These I do not think can have contributed any of the materials required. No very decided evidence of the age of these rocks has been given, but the general opinion as stated by Branner and Williams appears to be that the age of the Arkansas rocks is ether late Cretaceous or early Tertiary, and certainly not newer than this time. According to Hill, Pilot Knob belongs to the upper Cretaceous and the latter half of Austin Chalk sub-epoch. If these ages are accepted, then certainly the rocks in question had nothing to do with the formation of the Texas Tertiary clays.

KARYOKINESIS IN EMBRYOS OF THE DOMESTIC CAT.—PRELIMINARY NOTICE.

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In all sections of various embryo kittens that have been examined by the writer, up to those of embryos seventeen millimetres in length, karyokinetic figures are by no means an occasional or a rare occurrence, but are to be found in many situations.

In the preparation of these sections, no special cytological methods were employed, as the subject of investigation was the development of the central nervous system of the cat. The embryos were hardened in increasing strengths of alcohol, with no precautions whatever with regard to fixation. After remaining in 95 per cent alcohol for a number of months the embryos were imbedded in celloidin and sectioned. The sections were then stained in Grenacher's haematoxylin and mounted in Canada balsam.

The resting nuclei are spheroidal occasionally, but the more usual form is that of an elongated oval. Occasionally very peculiar, irregular nuclei are found, and one was seen whose length was three times its width, without the aggregation of chromatin to be described later, but with a clearly marked reticulum and nuclear membrane. Usually the nuclear membrane is not shrivelled or wrinkled in hardening, but is plump and distinct, clear cut on its outer line, and in almost all cases has taken a deep stain.

The chromatin in these resting nuclei is disposed in a reticulum that strongly reminds one of the bridles seen in plant cells. This reticulum is clearly continuous with the nuclear membrane, as may be seen in very numerous instances, the point of union of a strand and the nuclear membrane presenting a well-defined enlargement of the strand. In some nuclei which happen to lie in the proper position several of these points of union in a single nucleus appear in the same plane, giving the nuclear membrane the appearance of being toothed.

Occasionally a nucleus is found in which all that is to be seen within the nuclear membrane is this reticulum, without local aggregations of the chromatin. In the greater number of nuclei the chromatin is so disposed that certain local thickenings may be observed. Under a power of about 500 diameters these accumulations of chromatin appear to have no connection with the nuclear membrane, but each nucleus seems to have a well-defined nucleolus. Under a power of 1,200 diameters, however, the connection between the strands of the reticulum and this central body stand out clearly. This aggregation of chromatin may be condensed, and in some instances may be described as spheroidal; in other more numerous instances it is elongated, and, with its radiating strands of the reticulum, looks very much like a bone lacuna, with rather coarse canaliculi. Usually but one such body is found in a nucleus; but occasionally there are two side by side, or both near the nuclear membrane, and it is not rare to find four or five. From the behavior of these local aggregations and the strands of the reticulum to haematoxylin, it is not possible to determine a difference. Both have about the same tint, and any slight difference of shade may be attributed to the quantity of colorable matter present in the aggregations.

In situations where it is to be supposed that cell multiplication is proceeding rapidly, as in the Wolffian bodies and the inner lining of the cerebral vesicles and central canal of the developing cord, many nuclei are found whose nuclear membranes are indistinct, in many cases invisible. Those nuclei, however, are quite conspicuous, owing to the fact that the chromatin is no longer disposed in thin shadowy strands, but is in heavy solid skeins, taking a much deeper stain than any part of the resting nuclei. Moreover, these deeply staining bodies of chromatin in these nuclei assume the position of the nuclear membrane that has disappeared, thus forming a basket with irregular meshes. Thus far I have not been able to determine whether in these nuclei it is a single skein, or a number of segments, that enter into the formation of this basket; but in certain nuclei, where the basket was not very regular, detached segments were certainly determined. In some nuclei in which mitosis was well established the loops of chromatin, or chromosomes, were seen scattered through the nucleus, as if the basket had been broken into fragments and crushed in. No traces of the nuclear or achromatic spindle were observed before the monaster stage.

The monaster stage was seen in many nuclei, but the best view was always obtained when the achromatic spindle was lying at right angles to the line of vision. When the aster was seen from the pole the chromosomes were in such a tangle that no satisfactory view was obtained. In the nuclei of embryo kittens the chromosomes are short and thick, and in the haematoxylin employed took a very deep stain, in many cases almost black. For these reasons it was usually impossible to distinguish individual chromosomes in either the monaster or dyaster stage, but the ends of the chromosomes were usually distinct.

The achromatic spindle at this stage is fairly conspicuous and well defined. The chromosomes are seen clustered in the plane of the equatorial plate, while on both sides the fibrils of the achromatic spindle converge toward the pole corpuscle. From the region surrounding the pole corpuscles, radiating out into the cytoplasm, are to be seen the exceedingly delicate rays of achromatic substance, forming the polar cones. Many nuceli were seen at this stage presenting the appearance of the conventionalized diagrams, such as Quain's "Anatomy," tenth edition, vol. I., part II., figure 214, except that the chromosomes were not so distinct as in the diagram.

In the process of metakinesis all phases were seen, from that in which the limbs of many chromosomes remained in contact, while the apices of the loops had separated, to the complete dyaster stage. In some instances the ends of the limbs of two or four chromosomes remain in contact, the others having separated. In nuclei in which the two sets of chromosomes have migrated for some distance, and are separated by an interval equal to the average diameter of a resting nucleus, the exquisitely fine webs that stretch from the ends of the limbs of one set to the ends of the limbs of the other set may be seen in many instances. When the two sets are separated by a small interval the web is not easily seen.

In the dyaster stage the two sets of chromosomes do not present the appearance that is usually represented. As stated before, the chromosomes of the cat are short and thick, and the limbs do not extend in such a way as to make it easy to determine their number. It is stated that the nuclei of each species contain a definite number of chromosomes. From what can be determined in the nuclei under observation, each set of chromosomes in the dyaster stage contains four chromosomes, although it is difficult to determine this point with certainty.

The portion of the achromatic spindle between the pole corpuscles and the two sets of chromosomes can be made out easily, as the delicate webs are quite conspicuous in the dyaster stage, and seems to take a deeper stain in many instances than in the monaster stage. I am not certain that the webs of the spindle react to haematoxylin, but am certain that in some instances this seems to be the case. The radiating webs beyond the pole corpuscles, extending out into the cytoplasm and forming the polar cones, have not been made out in the dyaster stage.

The chromosomes in the two-daughter nuclei, then, assume the basket form. The baskets found in the two-daughter nuclei are easily distinguished from the basket in the initiatory stage of karyokinesis by the fact that daughter nuclei occur in pairs, and each basket is much smaller than that found in the mother nucleus. The meshes in daughter nuclei are also much smaller, and the chromatin is in a close tangle.

Of all the stages of karyokinesis in these nuclei, the dyaster stage is most conspicuous and most easily found. Mitotic figures are most abundant in embryos about five millimetres in length; in older embryos they are not so easily found. In examining sections from a five-millimetre embryo, some fields show karyokinetic figures in fully half the nuclei.

In these embryos karyokinesis was observed in the following situations:

I. Lining of primitive cerebral vesicles. Here they were most abundant. Nuclei bounding the cavity showed the figures especially well.

II. Lining of central canal of the spinal cord. Here also very abundant.

III. Lining of lumina of tubules of Wolffian bodies. Occasional.

IV. Epithelium lining the pharynx.
V. Within the branchial arches.
VI. Epithelium lining the branchial clefts.
VII. Optic vesicles.
VIII. Otic vesicles.
IX. Epiblast forming epidermis of face.
X. Walls of heart.