of chromosome segments between the M-chromosome and an autosome (= T^M). The second type has an exchange between the m-chromosome and an autosome (= T^m), and in the third type exchange has taken place between 2 autosomes (= T^a). If exchanges occurred at random between the 3 chromosomes in an irradiated sperm, the T^M- and T^m-translocations would be almost twice as frequent as T^a-translocations according to the length of the 3 chromosomes (I = M or m = 5.6 µm; II = 7.4 µm; III = 8.1 µm). Our observations did not confirm such an expectation (Figure 2 and Table). In all experiments T^a-translocations were more numerous than the 2 other types.

For the time being the most useful translocation is the T^M type. First, it is inherited from the father to all sons. Therefore the selection of males in a translocation strain of this type guarantees that all selected animals carry the translocation. In the 2 other translocation types the translocation is transmitted from the parents to half of the offspring in either sex. The separation of animals with or without translocation in such lines is very difficult or impossible. Second, the T^M translocation can hardly become homozygous because it is linked with the M factor which is always heterozygous in the males. There is the possibility that the T^M translocation can become a T^m translocation, if crossing over occurs between the break point and the M factors. Such an event has so far not been observed in 5 selected T^M strains for over 20 generations and a total of 500–1,000 offsprings. The transformation of a T^M into a T^m translocation would have as a single event no serious influence on a control experiment. Only if the combination of T^M/T^m or T^m/T^m were viable, the depressing influence of the translocation upon a natural population would finally be cancelled. This can happen much earlier with a T^m or a T^a translocation. Therefore we regard T^M translocations at present as the most useful and safe type for practical purposes. That does not exclude the possibility of using an integrated system of one or several translocations, which are viable in homozygous condition, combined with a T^M translocation as a safety measure to prevent the fixing of homozygous translocations in natural populations. We are at present exploring the possibilities of developing such multiple translocation strains.

Frequency of different translocations in *Culex pipiens* in 4 series of tests

Series	No. of translocations	T^M	T^m	T^a
1	31	7	3	21
2[a]	12	5	–	7
3[a]	21	8	–	13
4[b]	17	–	7	10
Total	81	20	10	51

[a] Only sperms with a M-chromosome tested. [b] Only sperms with a m-chromosome tested.

Zusammenfassung. Für die Anwendung von Semisterilität infolge von Translokationen zur Bekämpfung schädlicher Insekten ist der Grad der Semisterilität und die Art der zugrundeliegenden Translokation von Bedeutung. Von den bisher untersuchten 124 Translokationen hatten 101 einen Sterilitätsgrad zwischen 10 und 50%, 23 über 50 bis zu 85%. Mit dem männlichen Geschlechtsfaktor M gekoppelte Translokationen sind zur Zeit die für die Praxis am nützlichsten. Sie treten nicht so häufig auf als erwartet, machen aber doch rund $^1/_4$ aller getesteten Translokationen aus. Es werden Gründe angeführt, weshalb M-gekoppelte Translokationen nützlicher sind.

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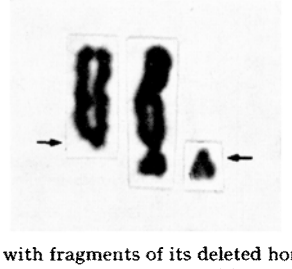
A Possible Case of Centric Fission in a Primate

The main mechanisms in the evolution of mammalian karyotypes have been centric (Robertsonian) fusion and pericentric inversion (Benirschke[1]). However, the origin of some complements with high diploid numbers and a predominance of acrocentric chromosomes is difficult to explain (e.g. Tarsius, Cercopithecus, Canis, Bos, etc.).

In 1967, Todd[2] (v. also[3–5]) put forward a hypothesis of karyotype evolution through succesive cycles of chromosomal fission (explosive or eruptive speciation[6,7]) and chromosomal stabilization by centric fusion and pericentric inversion (adaptive radiation). As we have indicated before[8], the theory is extremely appealing, but although Todd[2] states that 'The fissioning postulated here must be meiotic in vivo, and the negative 'evidence' against it which is principally based on direct somatic or tissue culture preparations is inadmissible', the main objection to the theory has been, precisely, that chromosomal fission has never been observed in a mammal, although it is known to occur in other organisms (Southern[9]).

Recently, we had the opportunity to analyze the chromosomal complement of the same male *Presbytis entellus* studied by Ushijima et al.[10]. The animal had 1 pair of unmatched chromosomes, which had been interpreted as the *X* and the *Y*. However, existing information on the chromosomes of *Presbytis*[11–16] indicates that these chromosomes are really autosomes, and that in our animal one of them must have undergone a deletion of the short arms. In a detailed study of the available pictures from the male *Presbytis* (kindly given to us by Dr. Ushijima), we were able to find 3 metaphases (25%) in which the deleted short arms had not been lost. Morphologically, both autosomal arms seem to have a centromere (Figure). The fissioning event would, then, have produced a stable, long telocentric (present in all metaphases) and a rather un-



Normal autosome, with fragments of its deleted homologous on both sides to show length similarity of short and long arms. Arrows point to centromeres on both fragments.

[1] K. BENIRSCHKE, *Comparative Mammalian Cytogenetics* (Springer-Verlag New York, Inc. 1969).
[2] N. B. TODD, Mammal. Chromos. Newsl. *8*, 268 (1967).
[3] D. STATON, Mammal. Chromos. Newsl. *8*, 203 (1967).
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[5] N. B. TODD, Mammal. Chromos. Newsl. *11*, 82 (1970).
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[16] T. C. HSU and K. BENIRSCHKE, *An Atlas of Mammalian Chromosomes*, Folio 199. (Springer-Verlag, New York, Inc. 1970), vol. 4.

stable short telocentric (present in 25% of the metaphases). If this is the case, our findings suggest that 1. chromosomal fission does occur in mammals, at least at the level of individual chromosomes; 2. some fission products can be highly stable; and 3. either centric fusion mechanisms involve a duplication of the centromere, or telocentric chromosomes can sometimes behave in a normal way with half centromeres.

Resumen. Los estudios cromosómicos llevados a cabo en un macho de *Presbytis entellus* sugieren que los mecanicos de fisión céntrica han intervenido en la evolución cromosómica de los mamíferos, que la fisión puede producir cromosomas telocéntricos estables, y que los mecanismos de fusión pueden acompañarse de una duplicación centromérica.

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Genetic Control over the Duration of G_1 Phase

Genes control the rate of cell reproduction, manifesting their effects in one or several cell systems. A number of mutant genes disturbing the normal rate of cell proliferation in different organs are known in the mouse. As was shown in our earlier work, the gene ocular retardation (gene symbol *or*) inhibits the mitotic activity of the retina anlage cells[1], and the gene fidget (*fi*) – that of the brain and eye-vesicle cells[2].

According to our present evidence, the mutant genes *or* and *fi* in the mouse significantly prolong the presynthetic period (G_1) of the cell cycle, resulting in the inhibition of the proliferative activity.

Material and method. We studied the parameters of cell cycle and the proliferative pool of retina anlage cells in 10-day-old embryos, homozygous for ocular retardation or fidget genes. Normal mice (+/+), with similar genetic background, were used as controls. To determine the parameters of the cell cycle, we made a single i.p. ^{3}H-thymidine injection (spec. activity 1.4 Ci/mmole) to the pregnant females (5 μCi/g of body weight). The animals were sacrificed at different periods from 30 min to 22 h. At least 2000 cells in the retinal anlage of each embryo were examined to estimate percentage of labelled mitotic figures. For term 15 embryos from 3 females were on the average analyzed. In order to determine the proliferative pool we made 3, 6 or 10 repeated ^{3}H-thymidine injections at 3-h intervals.

Deparaffined transverse sections through embryos (5 μm thick) were coated with liquid emulsion by dipping, exposed for 2 weeks at 4 °C, fixed and subjected to Mayer hematoxylin staining. The nuclei were considered labelled if they contained more than 4 silver grains.

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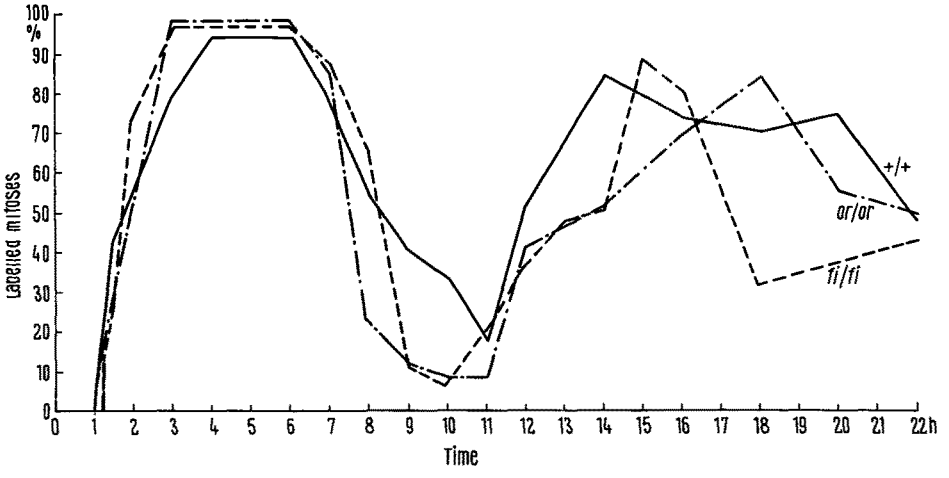

Fig. 1. Percentages of labelled mitotic figures in the retina anlage of 10-day-old +/+, *or/or* and *fi/fi* embryos after pulse labelling with ^{3}H-thymidine. Abscissa: hours; ordinate: % labelled mitoses.