throcyte nucleus treated with ammonia, the coiled structure has been shown by means of the ordinary light microscope[1].

It will be discussed in the near future how the flagellata-like chromosomes are different from the stalked bacteria.

G. YASUZUMI and Y. YAMAMOTO

Anatomical Institute, Medical Faculty, University of Osaka, Japan, February 23, 1953.

Zusammenfassung

Elektronenoptisch wird die Differenz zwischen den metabolischen Chromosomen und den Mikroorganismen, die den ersteren in mancher Hinsicht ähnlich sind, nachgewiesen. Durch die mechanische Einwirkung werden die metabolischen Chromosomen leicht zerstört; so werden Chromosomen in Chromonemata und weiter zu Chromofibrillen zerlegt. Die Mikroorganismen leisten der mechanischen Einwirkung im Vergleich mit den metabolischen Chromosomen Widerstand. Die quantitative Analyse der metabolischen Chromosomen ist durch Vergleich mit der Äquatorialplatte in der Metaphase möglich.

[1] Y. KUWADA (Private communication).

Notes on the Chromosomes of the Porcupine and the Chinchilla

This short paper is a report on the chromosomes of two interesting forms of rodents, the New World porcupine and the chinchilla, which belong to the suborder Hystricomorpha of the order Rodentia. Testicular tissues, fixed with FLEMMING's solution without acetic acid and stained with NEWTON's gentian violet, were used for study.

Chromosomes of the New World Porcupine. The porcupine occurring in North America is represented by only one species, *Erethizon dorsatum*, in the family Erethizontidae. This animal is a common forest inhabitant distributed throughout almost the whole range of the United States.

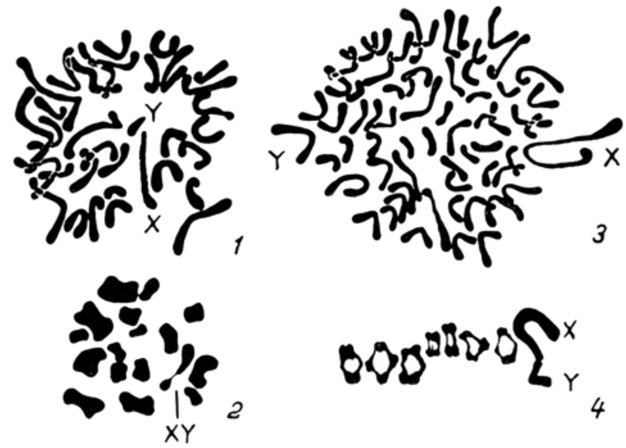
Based on five good metaphase plates of the spermatogonia, this animal was found to have the diploid number of 34 in the male (Fig. 1). The chromosomes have mostly subterminal and submedian centromeres assuming distinct J- and V-shape. Among them, however, two chromosomes are prominent because of their distinguishing features. One is a long rod-like element with slender, somewhat diffused outline. The other is a short rod-shaped one having a tapering end. Each one is without a partner corresponding in shape and size. There is thus sufficient reason to interprete the larger one as the *X* chromosome and the smaller as the *Y*.

Some first spermatocytes were found in process of division showing 17 bivalent chromosomes consisting of 16 autosomal bivalents and a heteromorphic *XY*-complex (Fig. 2).

According to MULDAL[1] the Old World porcupine, *Hystrix cristata* (which may not be closely related to *Erethizon*, according to WOOD[2]), has 48 chromosomes in the diploid set. We have not had access to any detailed accounts of the chromosomes of *Hystrix* other than the diploid number. Therefore we are not in position to enter into any discussion of the difference of the chromosome number between these two forms, although both cytologists and taxonomists will be interested in this question.

[1] S. MULDAL, John Innes Horticultural Institution, *38th* Annual Report *23* (1947).

[2] A. E. WOOD, Evolution *4*, 87 (1950).



Figs. 1–2.—Chromosomes of the porcupine (*Erethizon dorsatum*). *1*, spermatogonial metaphase. *2*, first spermatocyte metaphase. Figs. 3–4.—Chromosomes of the chinchilla (*Chinchilla laniger*). *3*, spermatogonial metaphase. *4*, first spermatocyte spindle, metaphase side view.

Chromosomes of the chinchilla. Chinchilla laniger is a large South American rodent belonging to the Chinchillidae. This animal has attracted attention because of the high value of its fur, and has been largely bred and domesticated.

The results of counting the chromosomes of clear metaphase plates in both the spermatogonia and two kinds of the spermatocytes revealed that the chromosome number of this animal was 64 in diploid and 32 in haploid. The diploid complement is provided with the chromosomes carrying subterminal and submedian centromeres, each one having two distinct arms (Fig. 3). Further, the diploid complex is very remarkable in showing two chromosomes which are prominent in shape and size. The one is a huge V-shaped chromosome, largest of all in size. The other is also a remarkable V-shaped element coming next in size. Both have submedian centromeres and remain unpaired since there is no homologous mate corresponding in shape and size. There is no doubt that these two particular chromosomes are to be regarded as the *XY*-complex (Fig. 3).

Primary spermatocytes show at metaphase 31 autosomal bivalents and a heteromorphic *XY*-complex which consists of a larger V-shaped *X* and a smaller V-shaped *Y* coming into contact by their shorter arms (Fig. 4).

Looking over the literature[1], the chromosomes of the animals belonging to the suborder Hystricomorpha have been reported in *Myocastor coypus* (Capromydae), *Cavia cobaya* (Caviidae) and *Hystrix cristata* (Hystricidae). The nutria, *Myocastor coypus*, was found to possess 42 diploid chromosomes which are of atelomitic structure except three dot-like ones. In the guinea-pig, *Cavia cobaya*, 64 chromosomes were known in diploid, showing the formula of 2V's + 62r's. The chromosome

[1] R. MATTHEY, *Chromosomes des Vertébrés* (Edit. S. Rouge, Lausanne, 1948). – S. MAKINO, *An atlas of the chromosome numbers in animals* (Iowa State College Press, Ames, Iowa, 1951).– J. Fac. Sci. Hokkaido Univ. Ser. VI. Zool. *9*, 345 (1947).

number of the chinchilla is just the same as that of the guinea-pig, but obviously the chromosome formula is largely different between them. Also the chromosomes of the chinchilla highly differ both in number and constitution from those of *Erethizon dorsatum* as well as *Hystrix cristata*.

The kindness shown to me in the course of this study by Dr. T. S. PAINTER, Dr. M. J. D. WHITE, and Dr. W. H. LEONARD is sincerely acknowledged here.

S. MAKINO

Institute of Zoology, Hokkaido University, Sapporo, Japan, and Department of Zoology, University of Texas, Austin, Tex., March 4, 1953.

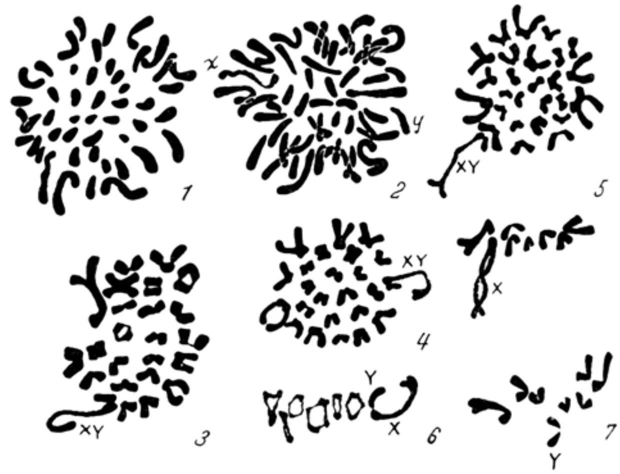
Zusammenfassung

Die Chromosomen des neuweltlichen Stachelschweins und des Chinchillas werden mit denjenigen einiger verwandter Nager verglichen.

Notes on the Chromosomes of the *Peromysci* (Rodentia-Cricetidae)

The deer mouse, *Peromyscus*, is represented by many species and subspecies and has a wide distribution throughout North America. The chromosomes of these field mice were investigated by CROSS[1]. His studies were, however, limited to the spermatogonial chromosomes, and the chromosome features in the course of meiosis have remained unknown. The present author has had an opportunity to observe the meiotic chromosomes in some species of deer mice, through the courtesy of L. R. DICE of the University of Michigan, who kindly supplied the material for study.

The forms studied are *Peromyscus polionotus polionotus, P. p. leucocephalus, P. leucopus texanus, P. truei truei, P. maniculatus maniculatus, P. m. bairdii, P. m. blandus, P. m. gambeli*, and *P. nasutus*. With the exception of *P. nasutus*, all species observed here showed 24 chromosomes in the haploid set (Fig. 3–4). *P. nasutus* was found to have 26 haploid chromosomes (Fig. 5). There is invariably a heteromorphic bivalent considered as the *XY*-complex in the haploid group of every species under study. It consists of a slender J-shaped *X*-element and a *Y* of a short rod-type. Generally the *X* is characterized by a faintly stained diffused outline, except the proximal end which is densely stained. The *Y* is uniformly stained, showing sometimes a small condensed body at its proximal end. In the first metaphase plate, the *X* and *Y* chromosomes lie in side-by-side association coming together at their proximal dense parts only, while the other parts remain free from close pairing. At the first anaphase, the *XY*-bivalent disjoins unexceptionally, the *X* and *Y* elements passing to the opposite poles (Figs. 6–7). The type of association between the *X* and *Y* chromosomes found in the Peromysci closely resembles that observed by MAKINO[2] in the red mice, *Apodemus* (Muridae-Murinae). Similar features of the *X* and *Y* chromosomes have also been found by MATTHEY[3] to occur in *Microtus pennsylvanicus* (Microtinae) and *Sigmodon hispidus* (Cricetidae). Further, the J-shaped *X* element and the rod-shaped *Y* element of the Peromysci are in sharp contrast to those of *Cricetus cricetus, Cricetulus griseus* and *Mesocricetus auratus*, which are of remarkably large V-shape.



Figs. 1–7.—Chromosomes of *Peromyscus*. *1*, spermatogonial metaphase of *P. polionotus leucocephalus*. *2*, spermatogonial metaphase of *P. truei truei*. *3*, first spermatocyte metaphase of *P. truei truei*. *4*, first spermatocyte metaphase of *P. m. blandus*. *5*, first spermatocyte metaphase of *P. nasutus*. *6*, First metaphase, side view, of *P. m. blandus*. *7*, first anaphase of *P. truei truei*.

The diploid number of chromosomes was observed to be 48 in *P. polionotus leucocephalus, P. m. maniculatus* and *P. truei truei*. Everey species is characterized by having a uniform complex which consists of a pair of large J-shaped chromosomes, a pair of medium J-shaped ones and a pair of small V-shaped ones, together with the remaining rod-like elements. But a considerable difference seems to occur in respect to length of chromosomes between species. On the whole, *P. polionotus leucocephalus* is characterized by having shorter chromosomes (Fig. 1), while the individual chromosomes of *P. truei truei* are remarkably much longer (Fig. 2). Since these differences in length of chromosomes are demonstrated in the preparations made by the same method[1], they may be accepted as chromosomal characteristics particular to each species.

The author wishes to investigate comparatively the chromosomes of the Peromysci, more thoroughly and with more satisfactory material, in the not-too-distant future, on account of the interest in the genetic as well as in the evolutionary relationship between species and subspecies.

Here, thanks should be expressed to Dr. L. R. DICE, Dr. T. S. PAINTER, and Dr. M. J. D. WHITE for their kind help in accomplishing this study.

S. MAKINO

Institute of Zoology, Hokkaido University, Sapporo, Japan, and Department of Zoology, University of Texas, Austin, Tex., March 4, 1953.

Zusammenfassung

Das miotische Verhalten der Chromosomen von Nagern, besonders die Morphologie der *X-Y*-Geschlechts-Chromosomen, wird beschrieben.

1 J. C. CROSS, J. Morph. *52*, 373 (1931); Cytologia *8*, 408 (1938).
2 S. MAKINO, J. Morph. *88*, 93 (1951); Cytologia *16*, 288 (1952).
3 R. MATTHEY, Chromosoma *5*, 113 (1952).

1 Fixed with FLEMMING's solution without acetic acid and stained by NEWTON's gentian violet method (modified by Dr. M. J. D. WHITE).