# LABORATORY PRIMATE NEWSLETTER

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EDITOR'S NOTES

Heard at the annual meeting of the Animal Care Panel in Chicago: (1) A research psychologist recovering from encephalitis had a rising titre to the Herpes T (tamarinus) virus. From this evidence, although only circumstantial, it was felt that he had Herpes T virus infection. No virus isolation was attempted. He was in contact with squirrel monkeys but had no known bites or scratches from them. (2) Good control of tuberculosis in a rhesus colony was obtained with the administration of 5 mg Isoniazid/100 cc of drinking water. The solution was prepared daily. It was estimated that each animal received a dose of 2.5 to 5 mg Isoniazid/kg/day. (3) Over 90% of imported monkeys showed serological evidence of having had measles. (4) Rabies was reported in a newly-imported rhesus monkey. (5) Tyzzer's Disease, a hepatitis with concurrent encephalitis caused by *Bacillus piliformes*, was reported in an Old World monkey. Previously this organism has caused great losses in mouse colonies. (6) A severe epidemic of *Yaba-like* disease in rhesus monkeys was described. (Yaba disease is a histiocytic tumor-like growth of viral origin. Unless it is severely traumatized by the animal scratching at it, the tumor disappears in a couple of weeks and the subject is immune thereafter.) The disease developed almost simultaneously at two primate laboratories and at an importer from whom both laboratories had recently received rhesus monkeys. In one of the laboratories, all animals housed within a building contracted the disease within a period of two weeks. It did not spread to animals in nearby buildings. Although the disease has similarities to Yaba disease, there are serological and epidemiological differences that suggest that it may be a varient. As with true Yaba disease, the Yaba-like disease developed after contact with African monkeys. The African monkeys themselves were not affected. (7) There is a new phenyl-cyclidine derivative that produced 20 min. to 2 hr. anesthesia in macaques when given 10 to 25 mg/kg I.M. Induction time was 4.1 minutes and did not vary with species or dosage. (8) While nocardiosis of the lungs can be differentiated from tuberculosis by the tuberculin test, it could be confused with T.B. on x-ray plates and during autopsy. (9) Squirrel monkeys were frequently seen outdoors in cold weather, even when the temperatures ranged as low as 15$^{o}$ below 0$^{o}$F. No respiratory diseases, frostbite, or other morbidity resulted. (10) Development of dental deposits in laboratory primates produced periodontal disease. Removal of the "tartar" was necessary to maintain periodontal health and prevent loss of teeth. (11) An atypical virus B was isolated from frequently observed Herpes-like facial lesions in rhesus. (12) The protein requirement of the young growing chimpanzee was defined as 15% of the diet, or 3.5 to 4.5 g protein intake/kg body weight. (13) An outbreak of paralytic polio in apes seemed to have been controlled by use of Sabin polio vaccine. (14) Laboratory-bred rhesus monkeys had 10% stillbirths and abortions, as contrasted with imported pregnant females which had 59% stillbirths and abortions and a large number of maternal deaths. The laboratory-conceived neonates (over 300 in number) averaged 485 g at birth, whereas the others averaged 420 g.

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Acknowledgment

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# SUMMARY OF THE KARYOLOGY OF OLD WORLD PRIMATES

B. Chiarelli

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For several years we have been investigating the chromosomes of the Old World primates. The present note summarizes the data available and its implications for taxonomy at supergenetic levels.

The most definite quantitative data is the number of the chromosomes, which vary from 42 to 72 (Table I).

All the species of the genera Macaca, Cynopithecus, Papio, Theropithecus, and Cercocebus have the same number of chromosomes (2n=42) and their chromosomes have the same morphology. Moreover they clearly interbreed. They appear to be a very compact group of genera.

On the other hand, the different species of the Cercopithecus genus have different numbers of chromosomes. The species studied by us and their number of chromosomes are listed in Table II. Morphologically the autosomes can be divided into 3 groups: submetacentric, metacentric or nearly metacentric, and acrocentric or subacrocentric chromosomes. A pair of nearly acrocentric chromosomes with a large achromatic region are always present. We have not been able to observe a relation between the acrocentric or the metacentric chromosomes and the total number of chromosomes which would suggest a centric fusion mechanism. Data on the total length of the karyotype measured on 20 metaphase plates for each species with a diploid number of chromosomes of 54-60-66 and 72 show a direct relation between total chromosomal length and number of chromosomes (Table III). The differences in the number of chromosomes of the different species of Cercopithecus may represent a peculiar type of polysomy.

Unfortunately, no data are yet available for the genera Pygatrix, Rhinopithecus, and Simias.

Recently, we had an opportunity to study the chromosomes of a female Nasalis larvatus. Its karyotype shows 48 chromosomes. The morphology of the chromosomes is very similar to Presbytis and Colobus. The marked chromosome is also very similar to those of these two genera.

Both Presbytis and Colobus have the same number of chromosomes (2n=44) and the length of the karyotype is the same. Moreover the morphology of their chromosomes is similar.

Hylobates all have the same number of chromosomes (2n=44). The total length of the karyotype and the marked chromosomes are also practically the same. A prevalence of the metacentric type of autosome is observed. The Y chromosome is the smallest yet seen in Old World primates.

Table I

Summary of Karyological Data on the Old World Primates

| Quantitative Data | | Genera According to Fiedler | Qualitative Data | | | | |
|---|---|---|---|---|---|---|---|
| T.C.L.[a] in μ | 2n | | Autosome Type[b] (pairs) M | S | A | Marked chrom.[d] | Y chrom.[d] |
| $92\pm12$ | 42 | Macaca | 6 | 13 | - | | |
| $90\pm10$ | 42 | Cynopithecus | 6 | 13 | - | | |
| $88\pm10$ | 42 | Papio | 6 | 13 | - | A | b |
| $89\pm10$ | 42 | Theropithecus | 6 | 13 | - | | |
| $85\pm10$ | 42 | Cercocebus | 6 | 13 | - | | |
| $94\text{-}125\pm10$ | 54-72 | Cercopithecus | 6-9 | 12-17 | 6-10 | C | a,b,c |
| $94\pm10$ | 54 | Erythrocebus | 6 | 12 | 7 | | b |
| ----- | -- | Pygathrix | --- | ----- | ---- | --- | ----- |
| ----- | -- | Rhinopithecus | --- | ----- | ---- | --- | ----- |
| ----- | -- | Simias | --- | ----- | ---- | --- | ----- |
| ----- | 48 | Nasalis[c] | 8 | 15 | - | | ----- |
| $83\pm10$ | 44 | Presbytis | 7 | 12 | 1 | B | a |
| $93\pm10$ | 44 | Colobus[c] | 8 | 13 | - | | ----- |
| $85\pm10$ | 44 | Hylobates | 11 | 9 | - | | c |
| ----- | 50 | Symphalangus | 12 | 11 | 1 | -(?) | |
| $83\pm10$ | 48 | Pongo | -- | 12 | 11 | - | |
| $94\pm10$ | 48 | Pan | 5 | 10 | 8 | - | a |
| $98\pm10$ | 48 | Gorilla | 5 | 10 | 8 | - | |
| $93\pm10$ | 46 | Homo | 4 | 13 | 5 | - | |

[a]T.C.L.= Total chromosomal length.

[b]M = Metacentric, S = Submetacentric, A = Acrocentric.

[c]Because the animals studied were female, the X chromosome is provisionally included among the autosomes.

[d]See diagrams at right.

A B C

a b c

Table II

Chromosome Numbers in the Different Species of *Cercopithecus*

| Species | No. of Animals Studied | Chromosome No. |
|---|---|---|
| *C. patas* | 5 | 54 |
| *C. talapoin* | 1 | 54 |
| *C. diana* | 2 | 58 |
| *C. l'hoesti* | 3 | 58,60 |
| *C. neglectus* | 3 | 58,62 |
| *C. nigroviridis* | 3 | 60 |
| *C. aethiops* | 2 | 60 |
| *C. cephus* | 2 | 66 |
| *C. mona* | 4 | 66,68 |
| *C. nictitans* | 4 | 66,70 |
| *C. mitis* | 3 | 72 |

Table III

Total Haploid Chromosomal Length

| *Cercopithecus* | Mean in $\mu$ |
|---|---|
| $2n = 54$ | $94.5 \pm 14$ |
| $2n = 60$ | $101.6 \pm 24$ |
| $2n = 66$ | $112.1 \pm 13$ |
| $2n = 72$ | $125.1 \pm 20$ |

The *Symphalangus* karyotype is very different from those of the *Hylobates*. The diploid number of chromosomes is 50. Of the autosomes, 12 are metacentric, 11 are submetacentric, and 1 is acrocentric. The marked chromosome is absent. *Symphalangus*, therefore, from a karyological point of view, appears to be different from the *Hylobates*.

The anthropoid apes (*Pongo*, *Pan*, and *Gorilla*) have the same number of chromosomes (2n=48) and their chromosomal lengths are the same. A chromosome marked by an achromatic region like those previously described is absent in all the anthropoid apes.

Man differs from the anthropoid apes in the number of chromosomes (2n=46) and in some of their features.

The ape whose karyotype shows the greatest similarity to that of man is the chimpanzee.

On the basis of these data some provisional taxonomic conclusions can be proposed. The genera *Macaca*, *Papio*, *Theropithecus*, and *Cercocebus* have to be separated from the species belonging to the genus *Cercopithecus* and put in a different subfamily which we propose to call *Papinae*, leaving the name *Cercopithecinae* only to species belonging to the genus *Cercopithecus*.

The *Symphalangus* must be differentiated from the *Hylobates*. Both have to be removed from the *Hominoidea* and be included in the *Cercopithecoidea*. The superfamily *Hominoidea* should consist only of the anthropoid apes (*Pongo*, *Gorilla*, *Pan*) and man. Among them, man is clearly distinguishable from the others and must be put in a different family (*Hominidae*).

Among the anthropoid apes (family *Pongidae*) the orangutan karyotype is clearly distinguishable from those of the gorilla and the chimpanzee. Such a difference can eventually be evaluated to separate this species from the others at a supergenetic level.

# HUDDLE AND SPRAWL BEHAVIOR OF SEMIFREE-RANGING SQUIRREL MONKEYS[1]

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During the course of studies of the semifree-ranging colony of squirrel monkeys (Saimiri sciureus, Roman type[2]) at the Monkey Jungle near Miami, Florida[3], our attention was drawn to two stereotyped postures the monkeys often assumed while resting on tree limbs. We will refer to these postures as the huddle and the sprawl.

When a squirrel monkey huddles, it squats with its head facing down and its rear end contacting the tree limb. Its arms are often between its knees, hands on the tree limb. Its tail comes up between its arms, and the end is draped over one shoulder. There is also a semi-huddle position which is the same as the huddle except that the tail hangs down. In the sprawl posture, the monkey is stretched out on its stomach, straddling the limb, with one or more of its arms and legs and its tail dangling below the limb. There is also a semi-sprawl posture in which the arms are not dangling. These postures seem to be common to all age and sex classes of Roman squirrel monkey, including babies less than three months of age and mothers with infants on their backs.

The monkeys huddle when sleeping on cool evenings, and often during the day. But when it's very hot, there is a high incidence of sprawls during daytime periods of rest and sleep. (During these hot periods,

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[1]We would like to thank Frank V. DuMond, General Manager of Monkey Jungle, for his cooperation and advice, and to acknowledge the assistance of Drs. Charles Southwick and James S. Coleman in intiating this research.

[2]There appear to be behavioral differences between the Roman and Gothic types of squirrel monkey, such as the occurrence of mirror displays in Gothics described by Paul D. MacLean (Mirror display in the squirrel monkey, Saimiri sciureus, Science, 1964, 146, 950-952). In a personal communication, MacLean indicated that, among his caged animals, only the Romans do a peculiar scratch with the stiff hind leg in which the scratching motion is extremely energetic and exaggerated, almost throwing the monkey off balance. We have observed this MacLean scratch by two adult Roman males which were recently captured and caged. In one case, the monkey did five of these scratches in succession, alternating hind legs. Our best information was that these squirrel monkeys came from the area of Iquitos, Peru. We have never observed a MacLean scratch by a Monkey Jungle squirrel monkey. This may be related to the fact that practically all of them were born in the Monkey Jungle.

[3]For a more complete description of the Monkey Jungle see Cooper, R. W., & DuMond, F. V., Laboratory Primate Newsletter, 1965, 4 [No. 1], 1-4.

we noted red uakaris and white-lipped tamarins also doing similar sprawls.) This suggested that the huddle-sprawl postures are related to ambient temperature. The huddle seems suited to retain body heat, while the sprawl exposes much more body area and would be conducive to increased body heat radiation and perspiration evaporation.

The specific hypothesis that we set out to test was that the proportion of a squirrel monkey's rest postures which are sprawls increases with temperature, and the proportion which are huddles decreases. That is, the probability of sprawling, relative to huddling increases with increasing temperature.

Since we were not free to experimentally manipulate the environment in the Monkey Jungle, we did the next best thing and chose our observation days on the basis of the temperature. The choice was always made independently of the behavior of the monkeys. In this way we managed to make our observations under a wide range of temperatures. In order to hold other relevant variables constant over all the observation periods, we observed the occurrence of sprawls and huddles in one area at the same time each day.

Because there is a feeding at approximately 10:30 every morning, we could depend on 15 to 30 squirrel monkeys being in the area of the feeding house from about 10:00 to 11:00 a.m. During this period the monkeys played and rested, the latter usually involving sprawling and/or huddling. Therefore, we selected that place and general time period for our observations. Observations were made on ten days, between August 5 and August 24, 1966. The daily observation periods ranged from 13 to 42 min. and averaged 27.6 min. All observations were taken between 9:55 and 10:57 a.m. The highest temperature during an observation period was $92^{o}$F. and the lowest was $85^{o}$F. During any one observation period, the temperature changed from one to three degrees, with an average change of $2.0^{o}$F. The mode of the ambient temperature measurements taken during an observation period was our estimate of the temperature for that period. This estimate could not reasonably involve an error of more than half a degree.

We couldn't conveniently calculate a sprawls-per-monkey or huddles-per-monkey figure because the monkeys kept moving in and out of the area. So we counted the total number of sprawls and huddles observed, and calculated what percentage of that total was sprawls. This percentage, then, was our measure of the probability of sprawling relative to huddling.

The results are summarized in Figure 1. The data support the hypothesis that the probability of sprawling, relative to huddling, increases with increasing temperature. The number of sprawls observed during an observation period varied from 1 to 20 (average = 11.5); the number of huddles varied from 0 to 21 (average = 9.9); the total number of sprawls and huddles varied from 12 to 32 (average = 21.4).

In spite of our attempts at objectivity, the data may well be biased

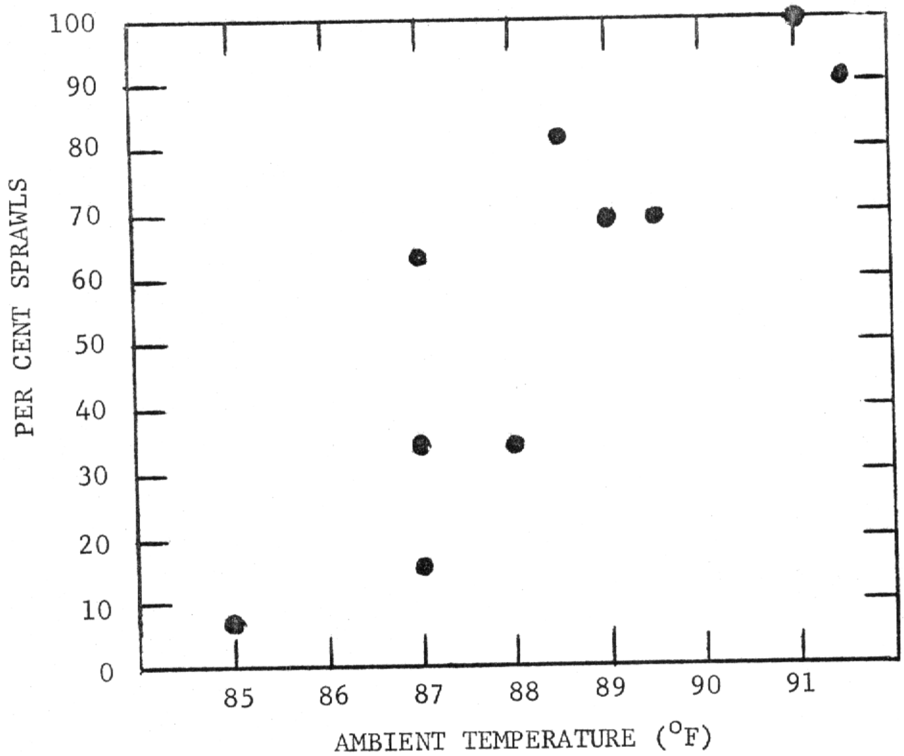


Figure 1. Percentage of sprawls as a function of ambient temperature. The following are the data points: 85.0, 7%; 87.0, 16%; 87.0, 34%; 87.0, 63%; 88.0, 34%; 88.5, 82%; 89.0, 69%; 89.5, 69%; 91.0, 100%; 91.5, 91%.

to some extent, so the study should be repeated in a controlled laboratory setting.

One complicating variable that we did not control was the activity of the individual monkey just before assuming a sprawl or huddle posture. We have often seen a very active monkey run along a limb and then suddenly drop to a sprawl. Other things being equal, the more active the monkey, the higher might be the probability of sprawling rather than huddling. Presumably body heat due to the monkey's activity increases the likelihood of a sprawl. This uncontrolled activity could account for some of the irregularity in our data.

Several observers have reported that caged squirrel monkeys develop bare spots on the dorsum of the base of their tails as a result of huddling. These bare spots were quite apparent in the semifree-ranging squirrel monkeys in April, but were gone in July and August. We suggest that the relatively low temperatures in April produce huddle behavior almost exclusively, and that this results in increased contact of the monkeys' tails with tree limbs or perches. This contact causes, in turn, the bare spots. By July, the temperature has increased to the point that much of the huddle behavior is replaced by sprawls, which do not involve contact between the base of the tail and the perch. This allows the fur to grow back. The bare spots sometimes become infected in caged animals. Presumably healing can be aided by raising the cage temperature so that the monkeys sprawl instead of huddle.

One other point worth noting is that most of our observations of sprawling and huddling were of animals in shade. They rarely rested in the direct sun. Once, after a rain, we observed several monkeys sprawled in the sun, perhaps to dry off.

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## SORE TAILS IN SQUIRREL MONKEYS PRODUCED BY PERCHES

In a previous note (Lab. prim. Newsltr, 1965, 4, [No. 1], 7) we reported the use of paired 1-in. diameter perches as a compromise between a shelf, which is preferred by squirrel monkeys (*Saimiri sciureus*) for resting but easily soiled, and a single rod perch which is cleaner but not preferred as a resting place by the monkeys. After a number of months, a drawback of the double perch as the principal resting place became evident: most of the monkeys developed two hairless patches on the dorsum of the base of the tail where it rubbed on the perches as the monkeys rested in their accustomed fashion with tail tucked under. Some developed sores with reddening of the skin and scab formation. These sores did not seem to bother the monkeys and were not treated, except by modification of the cage. We replaced the top pair of perches with a wire grid shelf, 6 in. wide, made of welded iron wire with nickel chromium plating applied after fabrication. The openings in the grid are 1 in. by 6 in. These shelves do not accumulate soiling material as a solid shelf does, and they do not require cleaning more often than does the whole cage.

The sores have cleared up, presumably because the monkeys do not always rest with the same part of the tail on the wire. A worn area on the dorsum of the tail is still present but is not a cause of concern, particularly since squirrel monkeys in a semifree-ranging natural environment (Monkey Jungle, Goulds, Florida; see previous article, this issue of the Newsletter) have been noted to have the same feature.--
Thomas H. Clewe and William DuVall, Department of Obstetrics & Gynecology, Vanderbilt University, Nashville, Tennessee 37203. (First author now at Delta Regional Primate Research Center, Covington, Louisiana 70433.)

PRIMATE ETHOLOGY AT BRISTOL UNIVERSITY

John Hurrell Crook

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The death of Professor K. R. L. Hall in 1965 was a severe blow to British research in primate ethology. Furthermore his attractive colony of research animals had to be destroyed for health reasons (Lab. prim. Newsltr, 1966, 5 [No. 1], 1-4). Therefore, we found it essential in 1966 to reappraise the study effort in primatology in this Department and trim our endeavors to the changed circumstances.

Although it is hoped eventually to resume laboratory research with primates at Bristol, we are at present engaged in developing that line of research least affected materially by Hall's death--field studies in Africa. Three workers are currently studying problems of social behavior and ecology based on data collected in Ethiopia and in Uganda. J. S. Gartlan is completing his studies of the vervet monkey on Lolui Island which include a detailed appraisal of the effects of monkey feeding habits on the changing ecology of the island. The writer is preparing for publication the results of ten months in the Ethiopian highlands observing the social structure and ethology of the gelada baboon. In particular seasonal changes in social organization correlated with differences in food abundance have suggested new ideas for relating food availability to social behavior. Pelham Aldrich-Blake joined the writer in Ethiopia in July, 1965, for a short study comparing the gelada with the doguera baboon at a place where the two species lived in sympatry. Contrasts in behavior matched interestingly with numerically defined differences in habitat and time utilization by the two species. Later Aldrich-Blake went to Uganda where, based at Makerere College, he is studying the behavior of the arboreal Sykes monkey, *Cercopithecus mitis*.

It is intended to strengthen and develop this Department's contribution to field studies in primate ethology. In 1967, Gartlan will be working in the Cameroons on the drill and plans will be completed for a team project in Ethiopia aimed at testing hypotheses regarding the relations between social structure of terrestrial cercopithecoids and their ecology. Gelada, doguera, and hamadryas baboons will be the prime objects of a long-term comparative survey. This project, which is to deal with several distinct research topics, is being jointly planned with Dr. Richard Andrew of Sussex University and with Dr. Hans Kummer of Delta Regional Primate Research Center of Tulane University. At the same time our excellent relations with Makerere College will be maintained as will our research in Uganda.

In 1966 the following publications were prepared in the Department:

Crook, J. H. Cooperation in primates. *Eugenics Review*, 1966, 58, 63-70.

Crook, J. H. Gelada baboon herd structure and movement: A comparative report. _Symposium of the Zoological Society of London_. In press.

Crook, J. H., & Gartlan, J. S. Evolution of primate societies. _Nature_, 1966, _210_, 1200-1203.

Gartlan, J. S., & Brain, C. S. Ecology and social variability in _Cercopithecus aethiops_ and _Cercopithecus mitis_. In Phyllis Jay (Ed.), _Explorations in primate behaviour_. In press.

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## PRIMATE FILM TITLES WANTED

As an extension of its basic bibliographic services, the Primate Information Center (PIC) of the University of Washington Regional Primate Research Center in Seattle, Washington, is compiling a film registry of primate footage, edited and unedited, in 8, 16, and 35 mm. In addition to basic data, such as title, author, producer, date, length, availability, and price, PIC would like at least one descriptive sentence on content. Information on research films not listed in other American and European film categories would be especially appreciated. The registry is only in the collecting phase and film information will not be immediately available.

Current services of the Primate Information Center include lists of unverified primate references sent weekly to investigators throughout the world and retrospective searches of primate literature, requested by subject and/or species.

## SIMIAN VIRUS REFERENCE CENTER PROPOSED

S. S. Kalter, Director of the Division of Microbiology and Infectious Diseases of the Southwest Foundation for Research and Education, San Antonio, Texas, wishes to make contact with primate users throughout the world with a view to exchanging specimens for investigations into viruses found in primates. He has outlined possible developments as follows: 1. Establishment of a simian virus reference center for the recognition, identification and characterization of viruses present in nonhuman primates. 2. Preparation and evaluation of working and reference reagents (seed simian viruses and specific antiserum) to recognized simian agents. 3. Development of a "diagnostic service" for those laboratories employing large numbers of nonhuman primates and without virologic capabilities. 4. Maintenance of a serologic survey on primate serums for indications of infections with human and nonhuman primate viruses. 5. Collection, analysis, and dissemination of information relating to virus problems of nonhuman primates. 6. Training of interested individuals in appropriate virus laboratory procedures (something for which limited space is already available).

In order to develop this program, cooperation with laboratories employing primates is necessary. These laboratories might supply the following: 1. Isolates obtained from simians for comparison with the established "prototype" simian viruses. 2. Serum samples (at least 5.0 ml per animal) from 15 or more nonhuman primates for antibody surveys. 3. Stool and throat samples on simians in need of study (after appropriate arrangements are made).

The following information on each animal from which a specimen is obtained should be submitted with the specimen: Genus and species, approximate age, approximate time in captivity, source of animal (origin and how handled since capture), current holding facilities (number of animals per cage, number of animals in same room, number of animals in connecting rooms, animal species contacted, indoor, outdoor, etc.), source of specimen (throat swabs, stool, tissue, etc.), and any other information that may influence results or interpretation of results.

The World Health Organization is becoming increasingly interested in zoonoses involving primates and in the use of primates in medical research. It is therefore taking steps to inform primate users who may wish to make contact directly with Dr. Kalter.--W. I. B. Beveridge, Consultant, Veterinary Public Health, Division of Communicable Diseases, World Health Organization.

## RECENT BOOKS AND ARTICLES*
(Addresses are those of first authors)

### Books

Primates. Comparative anatomy and taxonomy. VI. Catarrhini cercopithecoidea cercopithecinae. Hill, W. C. O., New York: Interscience Publishers, Inc., 1966.

The UFAW handbook on the care and management of laboratory animals. (3rd ed.) Edited by The Scientific Staff of the Universities Federation for Animal Welfare and assisted by Lane-Petter, W., Worden, A. N., Berton Hill, F., Paterson, J. S., & Vevers, H. G. Edinburgh: E. & S. Livingstone Ltd., 1966.

Section I, entitled "General Considerations," deals with the following topics: The legal protection of laboratory animals, The laboratory animals centre, Animal-house design, Animal-house equipment, Hygiene, Genetic aspects of breeding methods, Practical mating systems and record-keeping in a breeding colony, Handling laboratory animals, The nutrition of laboratory animals, Anaesthesia and euthanasia, The animal-house curator, The animal technician, Transportation of laboratory animals, Specific-pathogen-free animals, and Germfree animals. Later sections deal with care of various species of animals, ranging from invertebrates to primates.

Men and apes. Morris, Ramona, & Morris, D. New York: McGraw-Hill, 1966.

An interesting nontechnical book which has as its main theme "the many strange relationships that have grown up over the years between man and his nearest living relatives." Included is a brief survey of our scientific knowledge about apes and monkeys. The chapter titles are: Sacred apes, Apes as fools and sinners, Apes as lovers, Apes enjoyed, The ape discovered, The ape as an animal, Intelligent apes, and Apes exploited.

### Bibliographies

Laboratory animal science: A review of the literature for January, February, and March, 1966. Flynn, R. J. (Ed.) [Lab. Anim. Information Cen., Biol. & Med. Res. Div., Argonne National

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*References in this section without summaries have in many cases been taken directly from the Unverified Primate References prepared by the Primate Information Center, Regional Primate Research Center, University of Washington.

Laboratory, 9700 South Cass Ave., Argonne, Ill. 60439]. Argonne National Laboratory, ANL-7300, 1966.

This publication provides a bibliography covering recent articles in the field of laboratory animal medicine and technology. There is also a short summary of each article.

## Disease

A common source multi-household outbreak of chimpanzee-associated hepatitis in humans. Davenport, F. M., Hennessy, A. V., Christopher, N., & Smith, C. K. (Dept. Epidemiology, Sch. Pub. Hlth, U. of Mich., Ann Arbor, Mich.) American Journal of Epidemiology, 1966, 83, 146-151.

106 human cases of hepatitis associated with nonhuman primates have been reported from 26 episodes. Only one of these episodes has been described in detail. Chimpanzees were the animals most frequently incriminated as the source and the accumulated data emphasize that contact by humans with newly imported animals seems especially hazardous. Such animals are most frequently young ones. Woolly monkeys, Celebes apes, and one gorilla have also been implicated as transmitters of hepatitis. In August, 1964, an outbreak of chimpanzee-associated hepatitis occurred in Wayne County, Michigan. 5 human cases were identified in 4 households housing 17 persons and 2 chimpanzees. All subjects were studied either at home or in the University Hospital, Ann Arbor, Michigan. A series of unique circumstances identified one of the chimpanzees as the common source of infection, and permitted a precise estimation of the incubation period in 4 of the cases. The report describes the epidemiologic and clinical findings.

Bilateral, cerebellar, cortical sclerosis in a monkey. Ford, D. F. (Directorate of Med. Res., U.S. Army Chem. Res. & Develpm Lab., Edgewood Arsenal, Md.) American Journal of Veterinary Research, 1966, 27, 1489-1494.

In a rhesus monkey (used in an acute toxicity study), there was an incidental finding of bilateral, symmetrical, cerebellar, cortical sclerosis. The lesion was clinically silent. The lesion was paramedian and involved the folia of the inferior and flocconodular lobes of both cerebellar hemispheres near the geographic surface. It did not affect the anterior lobe, the posterior lobe, the vermian structures, or the cerebellar nuclei. It was concluded that this was a chronic lesion resulting from a pathologic process that occurred early in the life of the monkey. The pathogenesis of the lesion was thought to be a temporary ischemia caused by compression of the cerebellar arteries during a phase of swelling of the cerebellum.

Intestinal parasites of recently imported chimpanzees. Van Riper, D. C., Day, P. W., Fineg, J., & Prine, J. R. (6571st Aeromed. Res. Lab., Holloman Air Force Base, New Mexico) _Laboratory Animal Care_, 1966, _16_, 360-363.

A survey was conducted of the parasites found in 49 newly imported chimpanzees during the past 5 years. Results are presented in table form showing that _Oesophagostomum sp._ and _Balantidium coli_ were the two parasites most frequently found. Life cycles and treatments are reviewed and photographs of ova and larva are included.

Naturally occurring primary cutaneous tuberculosis in the rhesus monkey. Lindsey, J. R., & Melby, E. C., Jr. (Div. Lab. Anim. Med., Dept. Pathol., Johns Hopkins U. Sch. Med., Baltimore, Md.) _Laboratory Animal Care_, 1966, _16_, 369-385.

41 cases of tuberculosis occurred during a 3-year period in approximately 850 rhesus monkeys housed, at least temporarily, in a facility for conditioning and maintaining animals for research purposes. 3 (7%) of the 41 cases are reported in detail as they were considered primary cutaneous infections on the basis of tuberculin test results and anatomical findings at necropsy. The remaining 38 cases had distributions of lesions compatible with primary infection in either the respiratory or alimentary tract. Evidence from a variety of sources is presented to show that naturally occurring primary cutaneous tuberculosis is not nearly so rare as the literature suggests. The inconspicuous nature of the primary skin lesion and the rapid visceral dissemination which occurs in the rhesus monkey are believed to best explain why this route of infection has been incriminated so infrequently in the past. It is suggested that high frequency of visceral dissemination from peripheral lesions in the rhesus monkey may be a major fundamental difference between pathogenesis of tuberculosis in this species and children. The characteristic draining regional nodes associated with primary cutaneous infection are discussed as providing clues to early diagnosis and as significant sources of infection for other animals as well as personnel.

Diseases observed in monkeys. Honjo, S., & Imaizumi, K. (Nat. Inst. Hlth, Tokyo, Japan) _Bulletin of the Experimental Animals_, 1965, _14_, 162-163.

Shigellosis in monkeys. Honjo, S., & Imaizumi, K. (Nat. Inst. Hlth, Tokyo, Japan) _Bulletin of the Experimental Animals_, 1965, _14_, 164-165.

Psorergatic mange in the sooty mangabey (_Cercocebus torquates atys_) monkey. Sheldon, W. G. (Dept. Vet. Pub. Hlth, Coll. Vet.

Med., Texas A & M U., College Station, Texas) Laboratory Animal Care, 1966, 16, 276-279.

Diseases of an imported primate *Tamarinus nigricollis*. Nelson B., Cosgrove, G. E., & Gengozian, N. (Med. Div. Oak Ridge Inst. Nuclear Studies, Oak Ridge, Tenn.) Laboratory Animal Care, 1966, 16, 255-275.

The importation of tamarins from South America for experimental studies provided an opportunity for 506 necropsies. Parasites were usually found and some were responsible for much morbidity and mortality. An acanthocephalan, *Prosthenorchis*, was the most common and most serious pathogen. This worm caused lesions in the ileum that were secondarily infected, sometimes with fatal consequences. Other helminths, including a new species of *Spirura*, were also common but seldom incriminated as a cause of disease. The endoparasitic nymph of a linguatulid arthropod was often innocuously encysted in the lungs, liver, and other tissues. Various bacterial infections, especially peritonitis and pneumonia, seemed less important than *Prosthenorchis* as a primary cause of disease, but were the most common immediate cause of death. Rarely, fungi caused disease. Protozoan infections were present, but not shown to be pathogenic. *Sarcocystis* was seen as innocuous intramuscular bodies; this organism has not previously been reported from New World monkeys to our knowledge. Only one neoplasm was found, a malignant lymphoma with diffuse infiltrations in many tissues and a slight increase of round cells in the blood suggesting lymphocytic leukemia. A disorder of bone, probably osteomalacia from vitamin D deficiency, was until recently a serious problem in tamarins living many months in the colony. The morbidity and mortality from most other causes was much greater for new arrivals in the colony. These tamarins were imported adults that were recently captured, and the necropsy experience reflects the rigors of procurement.

"B" virus: *Herpes virus* Simiae. Hartley, E. G. (Med. Res. Council, Nat. Inst. Med. Res., Mill Hill, London, N.W.7, England) The Lancet, 1966, 1, 87.

This virus causes a benign disease in monkeys with herpetic ulcers on the tongue, mouth, and lips which heal in 7 to 14 days; the condition in monkeys resembles that of the herpes-simplex in man. In two surveys of newly imported Old World macaques, 2 to 3 per cent of animals were affected clinically. A large proportion of such monkeys show serological evidence of the disease. There is no direct evidence that other species of monkey cannot be infected. The disease in man is rare, only 15 to 20 cases having been reported so far but of these, all were fatal except 2 which showed residual damage to the central nervous system. Infection from the monkey is by scratches, bites, contamination of wounds, and probably by aerosol infection. One person died after contact with monkey-kidney-cell culture. The precautions for safeguarding laboratory workers are outlined and include strict quarantine of newly arrived monkeys for 6 to 8 weeks before use in cages containing no more than 2 monkeys. All monkey tissues must be considered dangerous and protective clothing must be worn. Handling should be reduced to a minimum and full use made of tranquilizers and mechanical devices. Any wounds to the handler must be washed at once with soap and copious amounts of water and a topical antiseptic applied. Vaccines against "B" virus are still at an experimental stage. The article concludes that, while the susceptibility to clinical "B" virus infection is presumably low, this agent must be the most lethal virus capable of infecting man. (Summary from The Veterinary Record, 1966, 78, 849.)

Incidence of naturally acquired virus infections of captive monkeys. Hsiung, G. D., & Atoynatan, T. (Dept. Epidemiology & Pub. Hlth, Yale U. Sch. Med., New Haven, Conn.) American Journal of Epidemiology, 1966, 83, 38-48.

Surveillance of simian virus infection was undertaken from October, 1963, to December, 1964. A total of 127 lots of tissue culture was examined and 107 virus isolates were made from 77 lots. These cultures were prepared from 393 healthy, asymptomatic monkeys of macaque and African green species. $SV_5$ was the most prevalent virus type (38 isolates) followed by foamy agents (32 isolates), $SV_{40}$ (17 isolates), measles virus (12 isolates), and an unidentified agent (7 isolates). Mixed infections occurred in 30 lots of cultures, 11 of which were prepared from individual monkey kidney. In monkeys stationed in quarantine for 2 months, incidence of virus infection was low. The virus isolation rate was high, however, in newly arrived animals. Therefore, there is the suggestion that monkeys kept in quarantine for 2 to 3 months may be more satisfactory for tissue culture preparations.

Diarrheic diseases in monkeys. Pietrzyk, J. (Polish Acad. Sci., Res. Ctr.-Lab. Animals-Breeding, Lomna-Las dist. Nowy Devor, Poland) Zwierzeta Laboratoryjne, 1965, 3, 177-185.

In connection with the beginning of production of an antipoliomyelitis vaccine, an acclimatization center for imported monkeys was organized in Wola Slawinska near Lublin. In the second week after arrival of the transports, epidemic diarrhea was observed in rhesus monkeys with a morbidity rate up to 80% and 50% loss of the animals. Bacteriologic investigation of the stools of the sick monkeys and those which died amid symptoms of diarrhea and of the internal organs showed presence of Shigella bacilli and of certain serotypes of Escherichia coli (0-111, 0-55) considered to be pathogenic. Shigella bacilli were isolated also from the stools of healthy monkeys, confirming reports of carriership without symptoms in monkeys. Animals kept singly or two in one cage were acclimatized better, and epidemic diarrhea was not observed in that case. In large groups of animals violent epidemics of diarrhea with mortality up to 50% occurred. Administration of chlorpromazine to the monkeys before transport and of mepatar and biofurazolidone prophylactically after arrival diminished the loss of animals in transport from 50.1% to 16.7%.

A case of melioidosis in a macaque monkey. Retnasabapathy, A., & Joseph, P. G. The Veterinary Record, 1966, 79, 72-73.

Melioidosis (Pseudomonas pseudomallei infection) producing lesions in the lungs not unlike tuberculosis was diagnosed in a monkey (macaque sp.) in the zoo at Johore Bahru, Malaya.

## Physiology and Behavior

Utilization of energy and protein of a commercial diet by rhesus monkeys (Macaca mulatta). Robbins, R. C., & Gavan, J. A. (Dept. Food Technol. & Nutrit., U. Fla., Gainesville, Fla.) Laboratory Animal Care, 1966, 16, 286-291.

Energy and nitrogen intake was related to nitrogen retention in rhesus monkeys. 17 adult rhesus monkeys, 3 male and 14 female, averaging 7.0 kg (range 4.0 to 12.1 kg) at the start of experiment were fed a maintenance level of a commercial diet containing 16.4% protein and 3.47 metabolizable calories per gm of diet. Body weight was stable at 6.8 kg and nitrogen retention was slightly positive, 0.84 g per day for the colony on an average intake of 2.85 g of nitrogen and 320 metabolizable calories per day. However, nitrogen retention varied from -31.0% to +27.7% of intake with 8 animals in positive and 9 in negative nitrogen balance. The animals in negative balance were significantly lighter ($p < 0.05$) in body weight although not necessarily younger animals and showed significantly lower ($p < 0.05$) apparent digestion coefficients for the nitrogen in the diet. The evidence indicated that physiological and/or biochemical differences in digestion or metabolic processes was an important factor in energy and nitrogen utilization.

Primate behavioral research in the USSR. Bowden, D. (Deutsche Forschungsanstalt für Psychiatrie, Max-Planck-Institut, Kraepelinstrasse 2, München 23, Germany) Folia Primatologica, 1966, 4, 346-360.

Investigators at the Sukhumi Medico-Biological Station have studied various aspects of behavior in the baboon, rhesus, and nemestrina. They have analyzed the structure of baboon society in terms of cohesive and divisive interactions among individual members which contribute to or detract from stability of the group as a whole. For several such modes of interaction, the ages at which young animals first participate has been determined. Modes of communication among baboons have been described and experiments performed in order to determine factors which preclude the species' developing language. Finally, a number of experiments have been carried out to determine environmental factors capable of inducing neurotic behavior in primates.

The development of maternal and infant behavior in the rhesus monkey. Hansen, E. W. (Rutgers--The State U., Newark, N. J.) Behaviour, 1966, 27, 107-149.

Effects of rearing conditions upon the behavior of rhesus monkeys (Macaca mulatta). Sackett, G. P. (Reg. Primate Res. Center, U. Wisconsin, Madison, Wis.) In Symposium on early deprivation and enrichment. Child Development, 1965, 36, 855-868. Abstract: Biological Abstracts, 1966, 47, No. 55501.

Normal values for clinical blood chemistry tests of the Macaca mulatta monkey. Anderson, D. R. (Radiobiol. Br., USAF Sch. Aerospace Med., Brooks Air Force Base, Texas) American Journal of Veterinary Research, 1966, 27, 1484-1489.

Specific clinical chemistry determinations are made in laboratory animals used in research programs, and these chemical components may reflect changes resulting from disease, exposure to radiation, or other stresses. Normal values for the rhesus monkey in the earlier published literature indicated considerable variation, possibly due to differences in colony management, assay procedures, and the relatively small number of monkeys used in each experiment. In a program with a large number of rhesus monkeys, some of the serum chemistry determinations from the baseline normal monkeys have been tabulated for use as reference for future studies. These determinations include glucose, electrolytes, enzyme activities, protein fractions, values from cerebral spinal fluid, and some other miscellaneous values.

Germfree cynomolgus monkeys. Wolfe, Lauren, Griesemer, R., & Rohovsky, M. (Dept. Vet. Pathol., Ohio State U., Columbus, Ohio) Laboratory Animal Care, 1966, 16, 364-368.

The techniques used for raising germfree rodents, dogs, and cats were readily applied to the monkey. 3 cynomolgus monkeys have been raised under germfree conditions and 2 are still being studied at 8 and 10 months of age. These animals grew as well or faster than those raised in a conventional laboratory environment but are similar in appearance and behavior. This preliminary study designed for developing techniques in raising germfree monkeys was stimulated by the need for experimental monkeys free of spontaneous disease.

## Drugs

Anesthetic technique for chimpanzee restraint. Day, P. W., Fineg, J., & Van Riper, D. C. (6571st Aeromed. Res. Lab., Holloman Air Force Base, New Mexico) Doc. Rep. No. ARL-TDR-65-18, Holloman Air Force Base, New Mexico, 1965. Abstract: Biological Abstracts, 1966, 47, No. 55217.

## Facilities, Care, and Breeding

Establishment of a squirrel monkey colony. Bantin, G. C. (British Drug House Ltd., Godalming, Surrey, England) Journal of the Institute of Animal Technicians, 1966, 17, 66-73.

Transportation and acclimatization of monkeys. Pietrzyk, J. (Polish Acad. Sci., Res. Ctr.-Lab. Animals-Breeding, Lomna-Las dist. Nowy Devor, Poland) Zwierzeta Laboratoryjne, 1965, 3, 93-114.

According to the literature and the writer's own observations, the main cause of losses of imported monkeys are enzootics with shigella or salmonella bacteria. These microorganisms occur in a certain percentage of monkeys in their native land. During transportation, as a result of the action of stress connected with unfavorable accommodations and diet weakening the resistance of the animals, the organisms become distinctly pathogenic and may cause severe enzootics. The author recommends: reduction of the effects of stress during transport by feeding tranquilizing drugs to the monkeys; treatment of the monkeys with antibiotics (Mepatar and Biofurazolidon) immediately after arrival at their destination; in order to avoid disturbing the ecologic relations in the intestinal microflora, besides antibiotics, the animals were fed cultures of Lactobacillus acidophilus in the form of the lyophilized preparation called "Lakoid."

Use of plegomazin in monkeys before transportation. Pietrzyk, J. (Polish Acad. Sci., Res. Ctr.-Lab. Animals-Breeding, Lomna-Las dist. Nowy Devor, Poland) Zwierzeta Laboratoryjne, 1965, 3, 115-124.

Plegomazin in doses of 0.7 ml/kg body weight was administered to monkeys before transportation from India.

The effect of plegomazin in the monkeys lasted about 16 hours and was characterized by sleep, absence of reactions to the environment, and reduced consumption of food. The losses during transportation were only 16.7%, i.e., 50% less than in monkeys shipped without previous administration of tranquilizing drugs.

Mating of squirrel monkeys (Saimiri sciureus) in captivity. Clewe, T. H. (Delta Reg. Primate Res. Center, Covington, La. 70433) American Zoologist, 1966, 6, 343-344. (Abstract)

Precautions against B virus infection. Perkins, F. T., & Hartley, E. G. (Div. Immulogical Products Control, Med. Res. Council Labs., Hampstead, London, England) British Medical Journal, 1966, 5492, 899-901.

## Ecology, Field Studies, and Taxonomy

On the identification of some marmosets family Callithricidae (primates). Hershkovitz, P. (Chicago Nat. Hist. Museum, Roosevelt Rd. & Lake Shore Drive, Chicago, Ill. 60605) Mammalia, 1966, 30, 327-332.

Taxonomic notes on tamarins, genus Saguinus (Callithricidae, primates), with descriptions of four new forms. Hershkovitz, P. (Chicago Nat. Hist. Museum, Roosevelt Rd. & Lake Shore Drive, Chicago, Ill. 60605) Folia Primatologica, 1966, 4, 381-395.

Hairy-faced "white-lipped" marmosets, or tamarins, of the Saguinus [or Leontocebus--ed.] nigricollis group are defined. The three species of the group, namely, S. graellsi, S. nigricollis, and S. fuscicollis, are arranged by their key characters. The first two species are monotypic while S. fuscicollis comprises thirteen races including the following described as new: S. f. avilapiresi, S. f. cruzlimai, S. f. crandalli. Bare-faced tamarins of the genus Saguinus are represented by the S. oedipus group with S. leucopus, S. oedipus (geoffroyi a subspecies), S. innustus, and by the S. bicolor group. The latter is monotypic with subspecies bicolor, martinsi, and the intermediate ochraceus described as new.

Patterns of parasitism in primates: phylogenetic and ecological interpretations, with particular reference to the hominoidea. Dunn, F. L. (George Williams Hooper Found., U. Calif., San Francisco Med. Cen., San Francisco, Calif. 94122) Folia Primatologica, 1966, 4, 329-345.

Studies of host distribution patterns of animal parasites can shed light on certain problems of primate evolution and ecology. Some of the pitfalls and potentialities of this approach are reviewed; the remainder of this paper is devoted to a consideration of parasitism in the hominoidea, with attention particularly to phyletic relationships among the living members of the superfamily. The record for the malaria parasites, ectoparasites, and helminths of these primates suggests that man is more closely related to the African apes (chimpanzee and gorilla) than to any of the Asiatic apes (orangutan and gibbon). Most of those who have worked in comparative anatomy, and with the chromosomes, hemoglobins, and serum proteins of these animals have arrived at the same conclusion.

Taxonomic status of tree shrews. Campbell, C. B. G. (Dept. Neurophysiol., Walter Reed Army Inst. Res., Washington, D. C. 20012) Science, 1966, 153, 436.

Some notes on the distribution of primates in the Sudan. Butler, H. (Dept. Anatomy, U. Saskatchewan, Saskatoon, Saskatchewan, Canada) Folia primatologica, 1966, 4, 416-423.

## Instruments, Techniques, and Suppliers

Laboratory animals: Part II. Animals for research. (6th ed.) Washington, D. C.: National Academy of Sciences--National Research Council, Publication 1413, 1966. (Order from: Printing and Publishing Office, 2101 Constitution Avenue, Washington, D. C. 20418. Cost $2.00)

This directory, a total revision of the 1964 edition, compiled by the staff of the Institute of Laboratory Animal Resources, is a guide to sources of experimental animals, tissues and fluids, and animal colony equipment and materials. Included are: 1. 900 listings, giving addresses and telephone numbers, for suppliers of the common domestic research species (chickens, turkeys, rabbits, mice, rats, hamsters, guinea pigs, dogs, cats, cattle, goats, sheep, and swine). Sources are listed for axenic and pathogen-free mice and rats. 2. 2660 listings, giving addresses and telephone numbers, for suppliers of 1358 species of animals obtained from nature, arranged in phylogenetic order. 3. 6 listings, giving addresses and telephone numbers for suppliers of tissues and fluids from over 50 species of laboratory animals. 4. 216 listings, giving addresses and telephone numbers, of manufacturers of feed, cages, washing machines, germ-free equipment, and ancillary laboratory equipment. Two indexes to the contents are provided, listing animals both by vernacular and scientific name.

A device to facilitate the restraint and handling of monkeys with minimal human contact. Fielder, F. G., & Casmer, C. J. (Biol. Res. Labs., Schering Corp., Bloomfield, N. J.) Laboratory Animal Care, 1966, 16, 395-402.

A restraint box is described which contains a plastic cone built into a wooden extension. This device allows the animal to be drawn into the cone until the head is imprisoned by a sliding panel. Clear plexiglas sections and hinged compartments then permit observation and safe handling with minimal hazard. A variety of routine procedures are now possible with safety.

Anatomy

Selected radiographs and drawings of the baboon. Banks, W. C., Greeley, R. G., Kemler, A. G., & Schultz, C. W. (College Station, Texas) Radiographic Aids, 1966. (Issued by the Pet Food Division, The Quaker Oats Co.)

* * *

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