Commentaries on South American Primates *

by

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(With 18 plates)

I

The matter need not to be emphasized ; old but always interesting since Buffon, extrincated and exitating through the difficulty of data, claiming for caution and being one of the must beautiful field to be walked over, owing its great importance and the great names that have already worked out and spoken on its structure and kinship. The Museum National had a considerable number of stuffed skins, to which I have tried to join serial skins and skulls ; I have seen, myself, the material in the Vienna Museum (Natterer) and some of the British Museum, in 1911. I have collected myself in a line comming from Caceres, Matto-Grosso, on the Paraguay River up to the Madeira. The results of that trip were already published (1) and brought forward as first result the new-genus *Callimico* (2).

The last standard work "A review of the Primates" — 1912, of Elliot, seemed to have exhausted the question. It had inclosed *Callimico* hurriedly. The suborder *Anthropoidea* there had the Platyrrhine divided into two families : *Callithrichidae* and *Cebidae*.

The *Callithrichidae,* with the genera :

Seniocebus (3 species), *Cercopithecus* (3 species), *Leontocebus* (19 species), *Oedipomidas* (3 species), *Callithrix* (14 species), *Callicebus,* (22 species).

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(1) Comissão de Linhas Telegráficas e Estratégicas de Mato Grosso ao Amazonas — Publicação n. 17 — Zoologia — Cebidae, Hapalidae — May — 1914.

(2) Brasilianische Rundschau, 1911.

The *Cebidae* with the genera :

Alouatta (14 species), *Pithecia* (8 species), *Cacajáo* (3 species), *Saimiri* (8 species), *Aotus* (15 species), *Ateleus* (12 species), *Brachyteleus* (1 specie) *Lagothrix* (6 species), *Cebus* (24 species). Plus *Callimico*.

As a whole 143 species (to which both Thomas, Lönnberg and myself we have added some other). From these two families — *Callithrichidae* and *Cebidae*, the last is divided into the sub-families *Alouatinae, Pitheciinae, Aotinae, Cebinae* and *Callimiconinae*. Pocock, in the paper of 1925, (3) has criticised this result ; and Cabrera, who is also palaeonthologist, has the "Seccion Platyrrhyni" divided into *Cebidae*, with the *Aotinae, Pitheciinae, Atelinae* and *Cebinae ;* and the *Hapalidae* divided into *Callimiconinae* and *Hapalinae*, in his "Manual of Mastozoologia" — 1922.

To show evidence in the kinship of a bulk of so great a number of living beings, is already a somewhat difficult matter, if we bring in mind that a complet set of material is not always available to readers, and so, convincingle evidence is not ever easy to show.

What is my aim here, is to display my commentaries on the material I have seen alive or measured on skins, skulls and skeletons in the quoted collections, zoos and nature, and to bring my data to the actual status of the matter.

Callimico MIRANDA RIBEIRO

Brasilianische Rundschau, Dec. 1911 — pg. 21. fig.

As much as possible I will left aside the species with the purpose of summarizing ; and whereas to the genera, *Callimico* calls for special attention ; it was inclosed in the appendix of the "Review" of Elliot, in the following lines :

> "Appendix 2 — In vol. I, on page 324, is a description of *Callitrix goeldi* founded in a specimen in the collection of the British Museum. This was in poor condition and without skull, and was reluctantly admitted as a distinct species, although it could not be assigned to any known form. Lately Mr. Thomas received some examples of mammals of Pará Museum, among which was a *C. goeldi* with its skull. This proves to have a remarkable interest and establishes the fact that this monkey is not only distinct from all others, but also represents a distinct genus to be assigned as follows : Family *Cebidae*, sub-family *Callimiconinae*, etc. (4).

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(3) Proc. Zool. Soc. Lond. April — 1925.

(4) Elliot — Op. Cit. III — pag. 261 — 1913.

Pocock has just said :

"One of the most interesting of the genera is *Callimico,* comparatively recently described by Thomas, *which has retained the last molar* (5) *and resembles the Cebidae in dentition*. Those who attach greater importance *to the number* of the teeth than to the structure of the feet will classify *Callimico* with the *Cebidae*. In my opinion *it is a primitive Marmoset ;* and its distinction from the rest of *that family,* may be expressed by dividing the Hapalidae into subfamilies — the *Hapalinae,* for *Hapale, Mystax, Oedipomydas* and *Leontocebus* and the *Callimiconinae* for *Callimico*". (6)

Let us read what has written Thomas himself after to have received from late Dr. Snethlage (Emilie) the skin and skull of the very type of the genus which has been also at the hands of Pocock :

"Oldfield Thomas, F. R. S. Z. S., exhibited a specimen of an Amazonian monkey referable to a species he had described in 1904 (pg. 4) from an exemple without a skull, as *Midas goeldii,* but which had recently redescribed by Ribeiro, from the living animal, as *Callimico snethlageri,* a new genus and species "intermediate between *Callicebus* and *Mico*".

"Thomas' examination of Ribeiro" type specimen, sent over by the authorities of the Pará Museum, showed that *Callimico* really was intermediate between the *Cebidae* and *Callitrichidae,* having the external characters of a Marmoset, notably the elongated claws, combined with the shape of skull and mollar formula of the Cebidae. The molars themselves posessed no hypocone, as in the Marmosets.

The animal being therefore, *intermediate in character between the two families Cebidae and Callithrichidae, there was great difficulty in deciding as to the effect its discovery should have on the systematic arrangement of the American Monkeys and as to whether these two families ought still to be kept separated.*

On the whole, as causing least disturbance, Thomas thought that the best plan would be to form a special subfamily, the Callimiconinae, for Callimico and to include this as a second subfamily with the Cebinae in the family Cebidae. *But that Callimico was a real genetic link between* the two families there seemed to be no doubt whatever". (7).

As we are seeing, Thomas himself is connected to the authors dividing the South-American monkeys in *Cebidae* and *Hapalidae*. Pocock from his side says :

"By almost common consent the Platyrrhine are assigned to two families — the *Hapalidae* or Marmosets and the *Cebidae* or Monkeys".

Indeed this consent is scanty of oppositors ; Pocock himself shows Gray, Forbes and Winge — considering the South-American monkeys and

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(5) Italics are mine.

(6) R. P. Pocock — Additional notes on the external characters of some Platyrrhyne Monkeys — P. Z. S. — April 3rd. — 1925 — pag. 38.

(7) Proc. Zool. Soc. London — 1913. Italics are mine.

Marmosets as number of the Family *Cebidae*. Excluding Weber — (2nd. Edit.) — none of them had yet heard of *Callimico*. But Weber — (2nd. Edit.) very strangely come to the division into the two families claimed by Thomas, Pocock and Cabrera — saying at the page 788 terminal of Hapalidae :

"Whereas to the genus *Callimico* Ribeiro and its questionable position to the *Hapalidae*, see page 796. (!).

And writing on the *Cebidae* he includes also *Callimico* (8)

"Hinsichtlich des genus *Callimico* Ribeiro, und seiner fraglichen Zugehorigkeit zu den Hapalidae — vgl. S. 796".

"Eine zweifelhaft stellung unter den Cebidae nimt zur Zeit das genus *Callimico* Ribeiro eint, mit der einzige Art. *C. goeldi,* Thos., aus den Amazonengebiet. Es hat Schaedel und Gebiss der Cebidae. Sein Ausseres und der Bau von Hand und Fuss gleichen aber denen der Hapalidae. Pocock halt es den auch fur einen Primitiven Hapaliden, die er demgemazs in die Unterfamilie der *Hapalinae* und *Callimiconinae* verteilt. Wir nehmen es wegen Schaedel und Gebiss unter die Cebidae auf; die von diesen abwaichende Structur von hand und Fuss sovie der "Krallen" der Hapalidae erkannten wir bereits auf s. 785 als eine secundare Differenzierung aus dem Zustand der Cebiden".

Pocock himself seems not to be an irreductible apologist of the two families.

"By the structure of hands and feet and the lose of the third molar tooth above and below, the *Hapalidae* are in my opinion, as expressed in 1917, clearly a specialised derivative group that branched off at an early stage from the monkey stock (I cannot agree with Prof. Elliot Smith that *Hapale* is the most primitive surviving Monkey (Essays of the Evolution of Man — pg. 141 — 1924).

The reduction of the hallux to a comparatively useless vestige and the conversion of the nails into long, sharp claws, were adaptations to a change in method of climbing and leaping, whereby the arboreal activities of the Marmosets came to ressemble those of the Squirrels". (9)

With the reserve for embryology, I woul like to be of the same advise; but on the ground of the tegulae, we have the same uniformity of the features since *Tarsius* and *Daubentonia* — as it was shown by le Gros Clark; (10) only as there are not sesamoid bones annexed to the claws that is to say, as the skeleton of the *Hapalidae* are not provided of the bones of the mechanism of the

(8) Max Weber — Saugethiere — 2ter Band.
(9) Pocock — Op. cit. pag. 38.
(10) Pr. Z. S. L. 1936.

claw, we should be authorised to admitt the feet of *Hapale* as a diverged or adapted character as also in *Callimico*.

I have seen *Callimico* for the first time when comming from the Madeira River — it was alive in the Zoo of the Pará Museum ; from the hands, feet and shadows of the pattern uniform colour of the fur, from the mode of bearing the tail, which could be whirled-up in the same way of the *apella* or other congeneric of the group, and the cranial feature allready known, the characters of the two families are absorbed by him. In the first glance I had doubted if it was not a hybrid. It was very tame ; and the manners almost slow. The sclerotica was dark like that of *Brachyteles ;* it seemed me somewhat *Callicebus* through the arrangement of the wiskers and others features ; somewhat *Mico* (of Lesson), from the hands and feet; hence its name. To day there are skins of the animal from many localities, and the last I have seen came from the Yaco and was sent me by my friends Drs. Oliveira (Director), Eládio Lima and Hagmann (Assistents) to the Museum of Pará.

So we have the following results : *Callimico* is first considered *Cebidae* by Thomas, by le Gros Clark and by Weber (*nolens volens*) ; opposingly it is considered *Hapalidae* by Pocock and Cabrera. Here we must return to a further description of Thomas :

> "Externally the animal is like a Marmoset, having similarly long, curved, compressed claws and doubtfully opposable pollex. It should, however, be noticed that the "nails" of many *Cebidae,* notably of *Saimiri,* are as compressed as in the Marmosets, the only difference being in their length. On the other hand the skull is provided with six cheek-teeth in each jaw, exactly as in the *Cebidae,* while the invariable formula of
>
> the *Callitrichidae* is $Pm.\ \frac{3}{3}, M\ \frac{2}{2}$.
>
> In its general shape the skull resembles that a small *Saimiri,* the braincase being high and rounded and the upper profile, from tip of nasals to occiput, evenly convex, with no resemblance to the flattened forehead and prominent brown-ridges of Marmosets. The orbits are not as slanting as in *Saimiri* more so than in *Callithrix.* Malar part of zygoma broadly expanded vertically. Anterior part of base of skull deeply concave between the pterigoids, with a narrow mesial septum. Pterigoids shaped quite as in marmosets, the ectopterigoid not so broadened as in most *Cebidae.*
>
> Lower jaw with the well marked chin and comparatively vertical incisors of the *Cebidae* instead of the slanted symphisis and incisors of the Marmosets. Coronoid and condylar processes nearer together than in either of the related form. Molars, although less narrow, essentially of the triangular type of those of marmosets, the terminal cingulum well developed, but with no distinct hypocone, the development of this cusp being what causes the caracteristic square form of the molars of the *Cebidae* and other monkeys, including man. In *Saimiri* the cusp is less developed and canines of normal relative proportions, not specialized as in the genus *Callithrix.*

Callimico thus proves to be almost exactly intermediate between the otherwise well-defined families Cebidae and Callithrichidae, and it is quite a doubtful question as to which of them it should be refered to. (11). On the whole, in spite of its marmoset-like claws and the structure of its molars. I am inclined to place it with the *Cebidae*, of which it would form a special subfamily.

We should thus get the following arrangement of the New-world monkeys:

A — Molars $\frac{3}{3}$. Skull rounded, forehead not flattened — Fam. *Cebidae*

a — Molars with hypocone. Digits with shortened nails (often compressed) ..... — Sub-Fam. *Cebidae*

b — Molars tringular, without hypocone. Digits with long claws ..... — Sub-Fam. *Callimiconinae*

B — Molars $\frac{2}{2}$ Skull with flattened forehead. Molars triangular, without hypocones. Digits with long claws..... — Fam. *Callithrichidae*.

It is to be noted the difference in structure between molars with hypocones and those without is not so abrupt as it sounds, for there is almost a perfect series of gradation from (1) the marmosets, which have no trace of hypocones, through (2) *Callimico*, which has a slight rise in the cingulum that might be called a potencial hypocone to (3) *Saimiri* which has small and simple hypocones, and is itself again separated from (4) *Callicebus* and other monkeys wich have complicated square molars with large hypocones and connecting commissures". (12)

I am not able to agree with my late friend on all words on such an accurate description : *Callimico* cannot be brought into comparison with a small *Saimiri*, if no by the upper canines. I believe Thomas was impressioned by these and the mandible of the monkey. From rough external and general sketch it is a small *apella* with the wiskers of *Callicebus* and the lateral tufts of *rosalia*. From the constitution and distribution of the hairs, these are uniform from the root and only grayish at the very tip.

The tail is convolvent, being whirled up just like in *apella*. From the skull it is to be compared only with *Aotus, Callicebus* and *Hapale*.

Profil (Pl. 1 — fig. 1) from *Aotus*, it has the vertex on the hind margin of the frontal and the same curve of the occipito-frontal ; the sphaeroidal constitution of the orbits and its position on the whole row of teeth.

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(11) Italics are mine.

(12) O. Thomas — On some rare amazonian Mammals, etc. Ann & Mag. Nat. Hist. 8.ª Serie — Vol. II — Pags. 131 a 133.

The angle between the facial and the brain-case axes is a much lesser obtuse one — than in *Saimiri ;* the facial angle about the same of *Aotus*. Temporal crest evident parallel to the fronto-occipital profil. Auricular duct directed somewhat backwardly and almost so deep as in *Callicebus*. Zygoma as in *Callicebus* but higer placed and much stronger than in *Aotus*.

Teeth are gradative from incisor to the last molar ; incisors slightly projecting ; c^1 moderately strong, somewhat the double of premolar ; tooth row regularly bent upward.

Mandible similar to that of *rosalia* with the coronoid process more decumbent ; mentonian region slightly stronger, rounded ; angular process projecting back and down-ward, like that of *Cebuella*. Tooth row regularly decreasing from the incisors with the p_2 of the same level of i_1; c_1 1/3 higher. Face (Pl. 1 — fig. 2) — forehead flat ; orbital ring ovoidal with the narrow end upwardly directed to the nasal basis ; there one sees the globular shape of the orbits. Nasal bones high ; not triangular, almost meeting the uper orbital line ; intermaxillary week, projecting at the sides upwards to the nasal bones, anterior border not low and turning backward slowly. Foramen of the trigemeus single, small ; malar at the same vertical or slightly projecting that of the sternal rim of the orbit ; its width as high as in most of *Callicebi*. Maxillar swollen at the root of c^1. Tooth row in a trapezial line, the high of c^1 making 1/4 of the high of the skull. I^1 about 1/3 larger than I^2, directed inward and obliquely cut in such a way. I^2 somewhat falcate, pointing outwardly in the same direction of c^1. This is a very stout tooth slightly inclined outward and with and anterior ridge for the contact with c^1. Mandible stout, of the same projection of that of *rosalia,* rounded to the symphisis and without the osseus projection of the posterior border that is seen in the flat symphisis of *Saimiri*.

Teeth of the same direction of the articular process, in *Marmosets,* not more outwardly directed as in *Saimiri,* its shape, high and disposition quite like that of Marmosets — chiefly *rosalia*. Upper side (Pl. I — fig. 3) face and crown outlines dolichocephalic ; sides almost parallel ; through the orbits almost quadrangular, hence an orthougnathous face, which is slightly projecting with a regularly bent incisive line, canines few prominents and almost not visible from above. Nasal region regularly sinuose, nasals parallel; orbital rim almost so and meeting over the nasal bones in a very open angle. Lachrymal bones and fossae large, evident from above. Frontal tetragonal, flat ; temporal ridges prominent, sub-parallel to each other as in *Callicebus ;*

gynglimae of the sutures about smooth. Parietals, large, strongly keeled by the temporal crest. Occipital counch very slightly perceptible from above. Zygoma slightly protruding on the sides of the temporal fossa, consequently the zygomatic arch slygtly seen from above.

Under side (Pl. 1 — fig 4) — mandible with the symphisis rounded and smoth, angular process prominent and gently directed inward. Incisors right cut in a transverse line ; the i_2 slightly projecting and directed inwardly ; the other teeth decreasing, quite like in the Marmoset group.

Face and brain case : — somewhat quadrangular with the up quoted projection on the incisors' region. Palate broad almost as broad as long. Incisors obliquely antrorse and gently introrse, their row short made over palate. Canines diverging but somewhat bent beckwards; molar row gently bent to the malar region. Molar ^{1} too strong, with the tubercles in three rows, the innermost low and obsolete ; last molar reduced but with tubercles again in two longitudinal rows. Naso-palatine foramina ovoidal, well place on the fore palate but with the anterior extremities somewhat diverging. Palate bone well separate from the maxillary roof of the mouth but being somwhat higher than these ; uvular process evident. Malar-maxillary wing wide, beginning from the pm^1 like in *Callicebus* and not at the pm^2, as in the Marmosets and *Saimiri*. *Foramen ovale* wery wide. Tympanic bullae compressed, smooth and ear opening at the insidae of the line comming from the ducts of the emissarie veins. Occipital bone flat, roughly ondulated and not overlapping slightly the parietals which are not seen from beneath.

Back view : (Pl. 1 — fig. 5) the back of the skull is formed chiefly by the parietals which let see the ridges for the temporal — muscle very prominent, parallel, at the borders of the temporal region. The squamosal is too weak and low and the outline of the skull, rougly speaking, somewhat half rounded shape. The pterygoide are not very protruding from beneath. And the most prominent features of this view — in the mandible — is the large size of the pm_1: as from the face view the mandible is rounded on the symphysis and moderatly hollowed. The canal for the nerve is laid more backwardly than in Marmosets and lower than in *Aotus* and *Callicebus*.

Under osteological stand point, in short, we can summarize *Callimico* as being a Primate with the skull of a *Callicebus* the mandible and feet of a marmoset and the tail and teeth of *Pseudocebus* that is to say : it is a generalized form. Thomas himself has not been very sure as to what family

it must be assigned; he was even reduced to be inclinated to agree with Pocock:

> "*Callimico goeldii,* Thos. O. 1407-1408. Cerro Azul Contamana. This is an important accession, as these two specimens are the first wild killed examples of *the remarkable Callimico* that the Museum has received, its two previous specimens, the types of *Midas goeldii* and *Callimico snethlageri* having both lived in the Pará Zoological Gardens"... "I am inclined to agree with Mr. Pocock's opinion that *Callimico* should rather be considered as a primitive Marmoset than as a member of the Cebidae". (13)

When writting his arrangement of the Marmosets he had left *Callimico* out of the keys. (14) Indeed, for him the question was that *Callimico* was "a real genetic intermediate between the two families regarding which "there seemed to be no doubt whathever" (15). If Marmoset or Monkey — this do not let it free from being an "intermediate link", with characters of both the sub-group. I mean that we have to follow Nature to avoid troubles.

II

Aotus HUMBOLDT

Rec. d'Observations de Zoologie, pg. 306, fig. 28 — 1811

Pocock has placed this genus into a peculiar subfamily — the Aotinae, apart from the *Callicebinae*. Cabrera let the same together with the last monkeys under the name *Aotinae*.

The full-grown is well known from the many species and varieties already described. [See Plate 3]. The skeleton was also described and compared by Wagner, and the main consensus of the genus is given by the two above cited eminent zoologists. Notwithstanding as to its phyllogeny, Humboldt says that it is to be related to the *Lori* of the old world (16).

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(13) O Thomas... Ann. & Mag. Nat. Hist. Ser. 10 Vol. II — pg. 255 — 1928 — (Italics are mine).

(14) O. Thomas. On the Systematic Arrangement of the Marmosets — Ann. & Mag. of Nat. Hist. — Ser. 9 — Vol. IX — 1922 — Pg. 198: "Thus, *apart* from Callimico", etc.

(15) P. Z. S. — 1913.

(16) "Appartient à un group particulier qui... par ses moeurs, la grandeur de ses yeux et.... l'ensemble de sa physionomie, a des rapports avec le *Lori* de l'ancien continent." (Humboldt, A. de, "Sur les Singes qui habitent les rives de l'Orenoque, du Cassiquiare et du Rio Negro" — Pg. 306 — 1811).

Remarking that *Aotus* was a Cebidae, Geoffroy de Saint Hilaire goes on the same way when he gives the figure of *N. trivirgatus*, in his "Mammifères" (17).

The results of Andreas Wagner are better-expressed ; he finds the same connections among *Aotus, Loris* and *Tarsius,* but approaches it more to the Saimiris and Callicebi (18).

Just now we have opinions like that of Menegaux, who says *Aotus* the connecting link between the Lemurs and Monkeys (19).

All that makes *Aotus* almost so prominent as if it was the known stem or at least the feader of the radiation of the species of South-American monkeys. Sure, it is not an intergradation as we have seen in *Callimico ;* but it is so markedly connected by its anatomical structures with *Callicebus* that it seems difficult to get it apart.

Ought we consider *Aotus* as the most remote outline of the original Tarsius ? Excluding the teeth it has many parallel features and his, rougly speaking, an improved sketch of same ; of course there is not any other living monkey which could approach more the stem than him. Notwithstanding the colouring pattern and other features are here somewhat more lorisine than tarsiine or Lemuroid.

This shall mean the evidence from the opinions up-shown giving stress to the theory of the descent of the american monkeys rather more from the prossimian stock than to approach them to the anthropoidean one.

The young is very much difficult to be drawn from any stock, chiefly the orbits, which are relatively much lesser and the zygoma which is wider

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(17) "Pour lui trouver de la ressemblance avec d'autres animaux, il faut, comme le remarque M. de Humboldt, le rapprocher du Loris paresseux (*Lemur tardigradus* Lin.) du midi de l'Asie ; alors les analogies sont tellement frappantes que, ne connaissant qu'un de ces animaux, et voyant la tète de l'autre on pourrait la prendre pour celle du premier et reciproquement. Tous deux ont à peu près la fórme génerale, les mêmes yeux, le même nez, la même bouche ; il n'est pas jusque aux trois raies du front qui ne se trouvent chez l'un comme chez l'autre, seulement elles sont noires chez le Dourucouli et blanches chez le *Lori*..., etc. (God. St. Hilaire, et Fred Cuvier, Hist. Nat. des Mammifères — Douruculi, Livraison 43, Août — 1824 — Platre.)

(18) "Seine systematische Stellung ambelangend, so lassen sich einige Beziehungen auf die Loris und Tarser auffinden, indess gehört, der Nachtaffe dem ganzen Bau seines Knochengerustes nach zu den ächten Affen. Er nährt sich am meisten dem Saimiri un den Springaffen, so dass er in Systeme am fuglichsten nach diesen beiden Gattungen gestellt wird, und alsdann erst die Seidenaffen nach folgen". (Dr. Johann Andreas Wagner, Beiträge zur Kenntnis der Wärnblüttig Wirbelthiere Amerika's — Abhandl. Akad. Wissensch, z. Munchen, 2nd., vol., pags. 431-432 — 1837).

(19) Menegaux — Les Mammifères, vol. 1.º, pg. 91 (in Ed. Perrier and Menegaux, La vie des Animaux illustrèe) : "Les Singes de nuit (*Nyctipithecus* Spix, 1823) forment la transition entre les singes et les Lemuriens".

and higher placed than in the adult [see Pl. 4, figs. 3-5]. The muzle is more tarsioid, that is to say shortened, the palate proportionately wider and the bullae more projecting from the basal plan. Seen from above and side the brain — case is similar to that of *Saimiri,* the orbital rim do not exceeds the lateral outline ; and the muzle is tappering somethat as in *Tarsius*. Milk incisives are not peculiar ; they are chiselshaped but with a restricted cingulum and elliptical outline in the transverse direction.

The mandible of the lactant is quite low, hapaline, Pl. 4, fig. 4 and pl. 5, fig. 3 — side view ; and the coronoid process is normally directed up-ward, not at all so declined as in the adult monkey. In some external features it is also somewhat hapaline.

The grounds of Pocock are the following :

> I — "Except by Gray, *Aotus* (*Nyctipithecus*) and *Callicebus* (*Callithrix*) have been associated in one group. There are several points of ressemblance between them in their skulls, but many differences also ; and I think it is perhaps on the whole better to follow Gray and keep them apart. *Aotus,* indeed, differs from all the other Platyrrhines, including the Marmosets in being nocturnal and provided with large eyes — hence its trivial name "owl-faced monkey"; and to accommodate its large eyes the skull has orbits enormously expanded both laterally and dorso — ventrally, so that encroach upon the cheeks, making them lower or shallower than in any other genus. The orbits open into the temporal fossa by a big space. The nasal bones, too, are compressed and long, projecting so as to be in advance of the lower canines and vertically over the alveolar border of the premaxillae, which is scarcely at all produced. In this sense the muzzle may be described as *orthognathous.* For the rest the inferior border of the mandible is approximatelly parallel with the alveolar border of the cheeck-teeth, but its angle is produced into a large angular lamina projecting beyond the condyle. The cranium is low, short, and tolerably broad, and the bullae are exceptionally strongly expanded in front of the meatus. Finally, the hands and feet are exceptional in having very large, coarsely ridged pads, probably an adaptation to nocturnal prowling ; and the vulva is not provided with a visible pendulous clitoris (see P. Z. S. 1920 pg. 99, for hands and feet; and pg. 106 for the vulva).
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> The skull of *Callicebus* differs from that of *Aotus* mainly in having orbits of normal dimensions, a normally high cheek, and more correct premaxillae, so that the muzzle cannot be described as orthognathous although it is less prognathous than in most genera. The jaws are narrowed distally, and owing to the smallness of the canines, the teeth form an almost unbroken curved, line, very different from that of Saimiris. (20) The mandible is of immense depth, its inferior border stopping donward and backwards from the longish symphysis and being compressed and inturned. The angle forms a lamina larger and rounder than in *Aotus* but similarly projecting. The zygomatic arch is much stouter than in that genus, exceptional in the downward projection of its antero-inferior maxillary angle. The bulla is inflated but the inflation is mostly below the meatus, not in front of it as in *Aotus* and some other, *e. g.* some forms of *Ateles.* Finally the soles of the hands and feet of *Callicebus* have pads normally smooth and

(20) Or *Aotus?* This query is mine ; the skull of *Callicebus* is seen in the Pl. V.

poorly defined except the terminal digitals, which are soft and cushion-like; and the vulva is provided with a short pendulous clitoris very like the penis of the male but smaller (see P. Z. S. 1920 — pg. 110). Neither in cranial nor external characters, therefore, are the likenesses between *Aotus* and *Callicebus* sufficiently close to justify the view that they are closely related, and I regard them as representing respectively two sub-families — Aotinae and Callicebinae". Pocock — P. Z. S. 1925 — pgs. 42-43. (21)

I have been, also, for long time and independently inclined in getting *Aotus* apart of *Callicebus*. For long time I have medited about their connecting links and at last I was led to the results of Wagner.

I have very carefully copied the words of Pocock in order do display my commentaries on the doubts he raised to my mind. And we will consider his consensus going by steps :

I — "*Aotus* differs from all the other Platyrrhines, including the Marmosets in being nocturnal and provided with large eyes".

Indeed this is its condition amongst Platyrrhines ; only I cannot say it exclusive nocturnal because he can see during the crepuscular light, and at the shadow of its cage when in captivity. Amongst Platyrrhine the monkeys which dwelt in the darkest woods, where the light is scanty, in South-America, we find *Callicebus* and *Yarkea*. Amongst the *Prosimia*, the nocturnal life is a common feature. This as even produced the writting of Römers :

> "Parenthetically, this raises the question as to whether the primitive primates were not nocturnal for this is the case in Tarsius and almost all of the Lemurs". (22)

Therefore, the nocturnal feature of *Aotus* can be a specialization and a return to the primitive, ancestral condition. The shape of teeth in the lactant is giving stress to this view.

II — "And to accommodate its large eyes, the skull has orbits enormously expanded both laterally and dorso-ventrally, so that encroach upon the cheeks, making them lower or shallower than in any other genus. The orbits open into the temporal fossa by a big space".

The skull of the adult *Aotus* is tarsioid, is even more tarsioid than lorisioid ; it is enought to compare its skull with that of *Tarsius* but the orbits indeed are additionally more lorisioid, because the orbital rim as being constricted marginally, becomes globular instead of being wide-spread, ciathyform, as in *Tarsius*. That is to say, they preserve the basal cyath of *Tarsius, plus* the orbital ring of the Lorises ; see Pl. 4 & 6.

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(21) "Additional Notes on the External Character's of some Platyrrhine Monkeys".
(22) Rõmer, A. S., Vertebrate Palaeontology — pg. 421 — 1935.

Forsith-Major claims for the lack of the lacrymal in some Prosimian :

> "In two genera (*Loris, Nycticebus*) the lacrymal desappear intirely from the outer surface of the cranium, outside and inside of the orbit. (23)

As a rule, the lacrymal is into the orbital hole in the adult *Aotus*. Forsith-Major says, quoting Gegenbaur :

> "In *Nyctipithecus* (*N. trivirgatus*), the whole of the crista anterior is formed by the maxilla, thus presenting a condition more closely approaching the Simiidae and Man than even in the Cercopithecidae. Nyctipithecus recalls *Mycetes* and *Ateles* only in the projecting of the antero-superior lacrymal portion, which separates almost completely the maxillary from the frontal". (24)

And from himself :

> "Forteen skulls. — As described by Gegenbaur in *N. trivirgatus,* the whole of the *crista posterior* belongs to the maxilla, which, moreover, generally descends into the fossa. In the only skull of *N. trivirgatus* available (Br. M. no 1459 b) — in a second skull of this species, the sutures are obliterated — the antero-superior angle of the lacrymal advances so far forwards, that the maxillary becomes separated from the frontal and a lacrymo-nasal suture is brought about. The same occurs in two skulls of *Nyctipithecus* sp. Br. M. n. 97. 10. 3. 8. and n. 92. 2. 18. 1). In the latter of which the sutures between the two bones is chiefly due to the breadth of the nasal in this place. In all other skull — *N. felinus* (seven specimens) *N. rufipés* (*one*) *N. sp.* inc. (two) — the frontal and maxillary join between lacrymal and nasal so as to form a comparatively broad fronto-maxillary suture". (25)

In the material of the genus in the Museum of Rio, I have seen the two types of lacrymal fossa as just seen ; but if we look at the young, the thing is somewhat different. Indeed there are two discrepancies, from the adult, in the whole : not only the orbits are comparatively lesser in rate — than in the adult — as the lacrymal is out of the orbital rim ; see pl. 4, figs. 3-4, side and crown views. This fact, not only is in agreement with the conclusion of Forsith-Major that the position of the lacrymal is in function of the lenght of the skull, because the skull of the young *Aotus,* is comparatively longer than that of the adult, as it can show to us that it is by the growth of the orbital ring that the lacrymal is generally inclosed into the orbital hole of *Aotus* and possibly of *Callicebus,* in other words, — there is not a rule for the position of the lacrymal in such monkeys.

Since the young stage the orbits are already formed, its rate to the bulk of the head looking just more like the orbits of the *Saimiri,* less the

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(23) Forsith-Major — Skull of Lemurs and Monkeys — P. Z. S., 1901 — pg. 151.
(24) Forsith-Major — Skulls of Lemurs and Monkeys — P. Z. S., 1901 — pg. 133.
(25) Forsith-Major op. cit. pg. 145.

up quoted position of the lacrymal bone, in this stage the general outline of the skull of *Aotus* finds its similar in the skull of Saimiri ; see pl. 4, fig. 4, side view. From the lacrymal pore this is not seldon to be placed more on the orbital rim than at the inner side of same, in *Aotus trivirgatus* even adult, and in many species (and individuals) of *Callicebi*. To reduce words it is enought to read Forsith :

> "In some cases C. *nigrifrons* Br. M. n. 51 c; C. *personatus,* Br. Mus. n. 45. 2. II (Pl. II fig. 7) and n. 51 d — the fossa appears quite as much outside the orbit as in extreme cases of *Ateles*". (26)

So from the stand point of the orbital structure we would be led to say Aotus a nocturnal *Callicebus*.

III — "The nasal bones, too, are compressed and long, projecting so as to be in advance of the lower canines and vertically over the alveolar border of the premaxillae which is scarcely at all produced".

Indeed, in this peculiarity, the anterior projection of the nasal bones over the alveolar border of the premaxilla, we have the most archaic characteristic which brings *Aotus* backwards as to the first place into the Platyrrhine series ; but the shape of the bones and the sport where they meet the frontal, is just the same both for *Aotus* and for *Callicebus*. The distal end of the nasal bones, in *Callicebus* projects over the alveolar rim of C^1.

The interorbital progression of the frontal also so onwards, is rather greater in that two genera than in any other of the suborder where it is, of course, one of the lemuroid features they have.

Also the mesial depression of same, not seldon going to the exhibition of a suture, is in the same case of archaism.

IV — "For the rest the inferior border of the mandible is approximately parallel with the alveolar border of the cheek-teeth, but its angle is produced into a large rounded lamina projecting beyond the condyle".

Sure, the exemplar of skulls of *Aotus* at hand of Pocock were not full-grown, because the lowness of the mandibular horizontal branch is a character of youth in almost all the Platyrrhine monkeys ; out of *Saimiri* and *Pseudocebus,* where this character is mantained through the life all over.

Whereas to *Aotus,* if we have not a milking, the two quoted borders of the mandible are divergent, (lesser in *vociferans*) and the mandible itself is of the same type of that of *Callicebus* and many other *Cebidae* with the chim

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(26) Forsith-Major — op. cit. pg. 145.

rounded, the few diverging ramia, and regularly bent over under margin. Its structure is quite the same and only the teeth can be described as different.

In the whole bulk of South-American monkeys we see two types of mandibles, respectively sub-divided in two other sub-types. (Pl. 5).

(FROM THE NOTHARCTINE ?)

Type I — The tarsioid type, with the upper und under bordes being approached backwards, or at least parallel, the symphysis rounded and projecting down ward into a knob, the ramia diverging; the processi somewhat seeted on trifoliate direction backwards ; canines more or less cylindrical, bowed, isomorphic with premolars and incisives ; (*Cebuella, Callimico,* etc.) .

Sub-type I — The same as the type with concealed trifoliation of the processes, the ascending branch about rightly angular, the symphysis flat, like that of *Pteropus* because the canines are more or less strongly develloped in stright conical tusks. Premolars more molariform ; incisives more or less diversified, depressed, chiselshape, compressed. (*Leontocebus, Mystax, Saimiri, Pseudocebus*) .

(FROM LICHAINOTINE ?)

Type II — The aotine type, with the chin rounded, under border diverging from the upper one backwards and going into a circular rim which may become, in some genera, "enormously develloped", (as, of course, in *Lichainotus laniger*) but converging backwards. Incisives chiselshaped, striqht, proclives. Canines more or less isomorphic with premolars and all-teeth coloured by a blackish cover only absent in old preserved skulls, of cage exemplars. (*Aotus, Callicebus,* the *Howlers* etc.) .

Sub-type II — The same, with the upper and under borders of the ramia almost parallel or slightly diverging and the canines big, stright, obliquely cutted tusks, not similar to the premolars; incisives chiselshaped, stright, proclives-converging. (*Cacajáo, Chiropotes,* etc) .

These two types are shown in the next photos (Pl. 5), and late Thomas had already placed the finger just on that diversity of mandibles found by Pocock when he wrote about the "Arrangement of the Marmosets" (27).

(27) Annals. Mag. of Nat. History, Ser. 9, Vol. IX, pg. 196 — 1922.

Indeed his differentials between the tribes of that small beings is just stated on:

A — Lower teeth normal, canines much longer than incisors.

B — Lower teeth modified. the canines little longer than incisors.

Had be brought his views on the whole of Platyrrhine monkeys he would surely see that the same thing occurs in the type of teeth in *Saimiri* and *Pseudocebus*, which preserve the same outline of teeth with the mandible of the marmosets, diverging in the flat symphysis as a result from the growth of the canines. So, the differentials sought by Pocock, trought the shape of the mandible, are not beween *Aotus* and *Callicebus*, but they show that the first splitting of the Platyrrhine Monkeys came trough theirs diets, denounced by the mandibular bone and teeth, of course modified from the first dominant insectivorous precursor in the following way :

I — Marginal border of the mandible at most parallel to the alveolar one, ramia diverging : *Cebuella, Callimico, Saimiri & Pseudocebus*.

II — Marginal border of the mandible diverging since the symphysis backwards, from the alveolar one and describing a bow which increases with age; ramia converging to the angular ends: *Aotus, Callicebus, Ateles*, etc.

Perhaps this convergence of the angular may be a marsupial descent or inheritance.

V — "As to the hands and feet pads and ridges of same". In *Aotus* it is not a striking character, amongst the Platyrrhine as Pocock claims ; the *Callicebi* shows the same shape of extremities and almost the same ridges ; only there are not so developped pads. We can compare his text fig. 5 c & D. with the *Callicebi*, we cannot let to see also the shape of tarsals in *Callicebus*, as a whole, in agreement with that of the feet of *Aotus*.

VI — Item — "the genitalia".

One of the first values of the work of Elliot, was to raise the useful criticism of Pocock who produced the analytical papers he published in the Proceedings side by side he read the monumental work of the noble old-man I have been so happy as to give a shake-hand in 1911, when I was securing zoological data in the N. York Museum of Nat. History.

About *Callicebus* he says :

> "Elliot extricated himself from the difficulty of *Callicebus* by placing it, quite indefensibly of course, with the Hapalidae". (28)

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(28) Pr. Zool. Soc. London, 1920 — pg. 113.

We have read in his paper on the "Arrangement of Monkeys" what he has written on the genitalia of *Aotus* and *Callicebus,* the last item of his results we need to see in our comments.

Indeed it is necessary to go back to the last quoted number of the Proceedings to see the strenuous work of Pocock on the "Characters of the South-American Monkeys" to be instructed of the value of such an important anatomical region to the position of such animals in a parental key.

But we see that *Lagothrix* (pg. 108, tex. fig. II, fig.A) *Alouatta* (*Cebus nobis*), (id. id. fg. B) and *Callicebus,* (pg. 110, text. fig. 12-A. & B.) are nearly of the same genital pattern and that — generalising — we will feel authorised in saying all such genera as very much relatives. Also *Leontocebus* and *Hapale* are not very far apart.

Then, all the true "many differences" between *Aotus* and *Callicebus* are reduced :

1 — to the genitalia
2 — to the nasal bones
3 — to the nocturnal habits.

The second is the only indiscutable evidence, the third is a relative and the first do not stay as a permanent one, because it is distructed by Pocock himself.

Indeed, it seems to me somewhat perplexing as to the judgement that Pocock have on the Uakarys, Yarkea and Cacajaó monkeys on such a peculiarity, because they show the same performance of *Aotus ;* we feel them sometimes rather more primitive than the last as we will shortly see. Of course Pocock himself give the text figure 6, D., from the genitalia of a female *Chiropotes albinasa* and wrote in the page 29 of his paper of 1925 :

> "The vulva is a narrow vertical cleft... and *there is no distinct external pendulous clitoris,* such as is seen in *Ateles, Lagothrix, Alouatta, Cebus* and *Callicebus*" (29).

We do know that *Chiropotes* is one of the genera of his *Pitheciinae*.

SUMMARYING WE CAN SAID :

I — AOTUS is a fine apparently isolated form, also full of queries on the unity of the S. American Cebidae ; from where comes it ? Externally

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(29) Pr. Zool. Soc. London, 1925 — Characters of some Platyrrhine Monkeys. — Italics are mine.

a big and improved sketch of TARSIUS, it would recall more properly LICHAINOTUS and the LORISINAE through NYCTICEBUS; the teeth, notwithstanding are normally Callicebinae; the oblong skull of the young somewhat recalls SAIMIRI; the full grown's skull is a Calliceboid one.

II — From the known S. A. Monkeys, AOTUS seems to be that which the known young has the longest skull approaching the SAIMIRI outline; its incisors and canines — in the young — have nothing to do with the TARSIUS relative teeth. The genitalia connect it more with the Pitheciinae.

III — Some authors have been led to make it a single member of a proper subfamilly-Aotinae; others say it a genus of the CALLICEBINAE; evidencie is for this last party.

III

THE SO CALLED "PITHECIINAE"

Callithrix Erxleben

Systema Regni Animalis, Mamm. pg. 55 — 1777.

Bluntschli in 1913 (30) has claimed against *Callicebus* he says to be new synonym to the genus *Callithrix*.

Indeed, *Callithrix* has been a very much fustigated generical name, but *Callicebus* may stand as one of the most proper corrections amidst many other made by Thomas in the Zoological Nomenclature. It is true that Thomas himself has used Callithrix "for the Titi-Monkeys" just up to 1903 when he says that :

> "names were numerous among South-American monkeys, but curiously enough, [he could] find none that had ever been applied to the Titis except the untenable *Callithrix*" (31) etc.

Therefore, besides erecting *Callicebus* for the Tities he applied *Callithrix* to the Marmosets, with *jachus* for type (op cit. loc. cit.), both genera tabulated at the same paper. Afterwards (32) he return to the right name for *jachus*

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(30) Verhandlungen der Anatomischen Gesselschaft in Greifswald, pg. 33.
(31) Annals & Mag. of Nat. Hist., 7 Ser., Vol. XII, pg. 455 — 1903.
(32) Annals & Mag. of Nat. Hist., 9 Ser., Vol. IX, pgs. 196-199 — 1922.

agreeing with Pocock who states *Hapale* for the marmosets before also called *Callithrix* (33).

For me the name *Callithrix* incloses the South-American *Pitheciae* of the authors. Trouessart, in his "Catalogus Mammalium" (34) lets it in the subfamily *Pitheciinae*: Under *Pithecia,* E. Geoffr. 1812, (as synonymous he quotes *Chiropotes,* Lesson, 1842) with the species *monachus, pithecia, chrisocephala, satanas, chiropotes* and *albinasa;* under *Brachyurus,* Spix, 1823 which he devides into the subgenera *Ouakaria,* Gray, 1849, with *melanocephalus* and *Brachyurus* with *rubicundus* and *calvus*.

In the "Supplement" he lets Brachyurus, following Palmer, writing *Cothurus,* Palmer, 1899. instead of *Brachyurus* preoccupied by Hiller, 1751 Fischer, 1814, and Thunberg, 1821 (35).

Palmer for this time wrote:

> "*Cothurus.* Palmer, Science, New Series, x N.º 249, pg. 493, Oct. 6 — 1889 (sep. pg. 4) New name for Brachyurus, Trouessart, 1898 (not Brachyurus, Spix, 1823, which is preoccupied by Brachyurus, Fischer, 1813, a genus of rodents — Type Brachyurus calvus, Geoffr. from the Amazon River, Brasil. Name preoccupied by Cothurus, Champion, 1891 a genus of Coleoptera. Replaced by *Neocothurus,* Palmer, 1903 — *Cothurus,* dock-tailed, allusion the short tail". (36)

At the chapter "The genera Pithecia, Chiropotes and Cacajão" we read Pocock:

> "In recent text-books, systematic treatises and faunistic lists, there is a curious mistake connected with the genera *Cacajão, Chiropotes and Pithecia* referred to the subfamily Pitheciinae — Chiropotes is not admitted. To the genus *Cacajão,* formerly called *Brachyurus* or *Ouakaria,* are referred *rubicundus, calvus* and *melanocephalus*. To *Pithecia* are referred *pithecia, monacha, albinasa, chiropotes, satanas* and by Elliot, a few more of doubtfull specific standing. The two genera as constituted are distinguished by the shortness of the tail in *Cacajão* and its lenght in *Pithecia*. A glance at the skulls, however, shows that allocation of the species is intirely indefensible and that *Pithecia* as above defined, contains two sharply distinguished genera, typefied respectively by pithecia and chiropotes, etc. etc." (37)

Just likely I had arrived to a similar conclusion in my paper up quoted of the Commissão Rondon (1914):

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(33) Annals & Mag. of Nat. Hist., 8 Ser., Vol. XX, pg. 247 — 1917.

(34) Vol. I — pg. 42 and 44 — 1898.

(35) Op. cit. Pags. 24-25 — 1904.

(36) T. G. Palmer & H. Merriam — Index Generum Mammalium — Pg. 201 — Washington.

(37) Pocock, P. Z. April 3rd. — pgs. 29-30.

"*Callithrix*. Erxleben Olfield Thomas has stated for the *Hapales* the name *Callithrix*, typefied by *H. jachus*. I believe if we took the first name quoted by Erxleben of such genus, the type may be C. *pithecia*. As such a species is just the *Pithecia monacha* auctorum, the name *Callithrix* may be reserved for the monkeys of that group. (38)

Callithrix monachus was quoted and its skull figured in the plate 7 and 8th, and the complete skeleton at the plate 9 — at 1/3 of nat. size, of the same paper, where I have placed *albinasa* under the genus *Chiropotes* described from Maria de Molina, Matto-Grosso and figured with the skull of its skeleton (39).

We may begin with the correction of the wrong up writen : "As such a *species* is just the *Pithecia monacha* auctorum" which may be writen : As such a genus has just the Pithecia monacha, etc. It is widely known, that since Gray, the *type* of the so called — *Pithecia* — has been overlooked, what has been the source of many difficulties for systematists.

If we begin with him we have :

"Hairs annulated — 4 — *Pithecia rufiventer*, the wiskered Yarkee. B. M. Grayish black, pale washed ; hairs rather soft, with a subterminal ring : forhead, like back, with moderately elongated hairs ; moustache yellow ; belly red. Young. Moustache white, beneath grey. Saguin. Buff., suppl. VII-t. 31 *Simia pithecia*, L., — Fox-tailed-Monkey, mus. Leves. T. 4.? *Pithecia rufiventer*, Geoffr. ; Kuhl. *Pithecia rufibarbata*, Kuhl. *Pithecia nocturna*, Less. *Pithecia capilamentosa*, Spix, Bras. t. II. P. pogonias, Gray, Zool. Sulph. p. 13, f. 2! Ann. & Mag. Nat. Hist. 1842 - 10, pg. 256! The young specimen in the Paris Museum on which *P. rufiventer* was described appear to be this species, but the belly is scarcely red" (40).

If we read Schlegel, on the synonymy of *Pithecia nocturna* we will have :

"*Simia pithecia*, L., Syst. Nat., pg. 40, n.° 22, stated over the Fox-tailed. Yarkea, pg. 195, n. 4 (young male)". (41)

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(38) Miranda-Ribeiro — Commissão de Linhas Telegraphicas e Estratégicas de Matto Grosso ao Amazonas — Mammiferos — Pgs. 18-19 — 1914.

(39) Idem, idem — Pg. 17 — Pls. 6 & 7.

(40) Gray — Catal. of Monkeys, Lemurs & Fruit Eating Bats — Pg. 60 — 1870.

(41) H. Schlegel — Monographie des Singes — Pag. 217 — 1876 ; "*Simia pithecia*, Linné Syst. Nat. pg. 40 — N. 22 établi d'après Brisson, le Sapajou a queue de renard, pg. 195, n. 4 (jeune mâle)".

If we follow Elliot we will have :

> *Pithecia capilamentosa,* Spix, as a good species ; *Pithecia rufiventer,* Geoffr. as synonymous of *Pithecia pithecia* and P. rufibarbata, Kuhl. synonymous of *P. chrysocephala*. In such way he gives five species viz : *P. monacha, P. capilamentosa, P. albicans, P. pithecia* and *P. chrysocephala*.

One sees well that, for Pocock *Pithecia pithecia* is the *Pithecia leucocephala* Audebert, which Gray has provided at as same as *chrysocephala*. But why all authors have forgotten *Pithecia pithecia* Audebert (42) which precedes leucocephala it is to me a matter not explained.

Natterer who has collected *leucocephala* and *chrysocephala* says that

> "the young female (he) collected together with the old male of the first at the "Forte do Rio Branco", was coloured like the "parauaçú", dark brown with the end of the hairs whitish, the tail dark brown stained with brownish yellow, the hairs of the hands and feet black. The hairs on the face longer and feebler than in male, dark brown with the ends brownish white, somewhat orchraceous to the nose". (43)

On the Parauaçú (*P. chrysocephala*) which he says to have collected near Manáos (Barra do Rio Negro) :

> "In the female the hairs of the body all over, are black with the ends yellowish, colour which do appears somewhat mixed on the tail. The hairs on the temporal and facial regions ochraceous, on the under parts from the chin brown-red. One exemplar labelled by Dupont in the Museum of Paris as *Pithecia rufiventris* agrees with the here described. It seems to me consequentely, that the *P. rufiventris,* Geoffr. *rufibarbata,* Kuhl, and *pogonias,* Gray may be labelled *P. chrysocephala".* (44)

To the belief of Gray that in *leucocephala* "the forhead was yellow when fresh and white when faded by exposure" ; and of *Geoffroy* who thinks "the colour depends on the size of the specimen, (45) we have to oppose the information of Natterer, at the same page, telling that the young male :

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(42) Hist. Nat. des Singes — 6ème Famille, pl. 1, pg. 7.

(43) Natterer — in Pelzeln, Brasilische Saugethiere, pg. 14 — 1883: "Ein mit dem Mannchen in Gessellschaft angetroffenes (junges) Weibchen hat ganz die Farbe des Paraguaçú (sic), dunkelbraun mit weisslichen Haarspitzen, der Schwanz dunkelbraun und gelblichgrau melirt, die Haare auf dem Handen und Fussen schwarz. Haare in Gesichte langer und weicher als am Mannchem, dunkelbraun mit braunlichweissen Spitzen, zunachst an der Schnauze blassocker-farben", etc., etc.

(44) Natterer — in Pelzeln — Op. cit. pg. 14 — 1883: "Am Weibchen des Paraguaçú, Barra do Rio Negro, Marz 1883, sind die Haare des ganzen Oberkõrpers Schwarz mit gelblichen spitzen, die auf dem Schwanz zimlich verscwinden. Die Haare an der Stirne und an den Wagen ockerfarben, an Unterleib von Kinne an rost roth. Ein in Ihare 1885 von Dupont in Paris als *Pithecia rufiventris* besogenes exemplar stimmt mit dem obigen uberein. Es scheint mit daher nicht unwarscheinlich, das *P. rufiventris,* Geoffr., *barbata,* Kuhl. und pogonias, Gray, zu *P. chrysocephala* goheren durften".

(45) Gray — Catal. pg. 59.

"Has already the white hairs and many brown tipped hairs on the arms and thigs. (46)

Hence we have to reduce to the respective species *Pithecia capilamentosa* Elliot and *P. pithecia* Audebert. This last is very alike in outlines to the plate of Spix's capilamentosa which is a female; and we have to tell, that under the *Pithecia rufiventer* Gray, have been placed together the females of *P. leucocephala*, Audebert and *chrysocephala*, Geoffr.

But, after all that we have seen, the matter stands on the following lines: *leucocephala* or *chrysocephala* have the female dimorphic of males and too much nearer of *monachus*, which has the young and the female pratically like the male. Also *albicans*, Gray, has the female of the same colour patern and shape of the male and therefore we may say that the *Callithrixes* may be tabulated at the following characters:

Callithrix ERXLEBEN 1777.

(*Callithrix pithecia* Erxl).

Body and tail subaequal; the first densely covered by flufy, long hairs, which are decumbent to the sides and make a whorle at the base of the neck and are directed forward on neck and crown. Tail floconous, somewhat vulpiform, decumbent or not to the sides never making there a long concavity at the underside, not convolvent and very weakly dressed of muscles.

Underside with the hair somewhat wholly, from the throath to the thighs. Nails on the pollex and hallux, subcompressed at the digits and toes. Face sometimes the forhead to the vertex, hands and feet covered with short hairs, that of the head short and more scarce on the nose (which is wide and platyrrhine) and sometimes almost absent on the face. Gradation on fours. Skeleton solid; skull lemuroid, orbitae antrorsae, zygoma feeble. Mandible with the angular region moderately rounded and expanded backward. Costae wide, strong. Lumbar vertebrae short, stark. Fore feet shorter than the under or back ones. Tail vertebrae long and thin. Hands and feet about so long as the cubitus and tibia. Incisive protruding onward; canines very strong, diverging and wide apart from incisives.

This general diagnosis has the two restrictions:

(KEY TO THE SUB-GENERA)

I — Males and females dimorphic; sides of the head and face allways provided with patches and whiskers of coarse hairs short-cutted

(46) Natterer — in Pelzeln, op cit., pg. 14: "Ein zweites Mannches welches junger zu sein schien, hate schon die weissen Haare und viele braune Haarspitzen auf den Armen und Schnkeln'.

and densely set ; in the male the crown and the face free from the long hairs of the nape, which do not cover the ears. Young and female fox-tailed ; old male with the tip of the tail somewhat up-curved as if prehensil. Male fundamental hue black ; female grizzly with the hands rusty-black : Subgenus *Yarkea* Humboldt — 1811.

Species which may stand as *species inquirendae* :

Head white (from the young); arms brown.....
Callithrix (Yarkea) *pithecia* (L) (♀ capilamentosa Spix).

Head yellow rusty-fawn intermingled with black, arms black.....
C. (Y) *chrysocephala* (Geoffr.).

II — Sex alike ; head densaly covered by the hairs of the nape which let free only the face ; that finely covered by short hairs in young and females; naked in the adult male, General hue grizzly.....
Sg. *Callithrix* H. Idem.

Species :

Fur more or less widely tipped with white; hands white from the carpal region.....
C. *monachus* Humb.

Fur of the dorso-caudal region blackish grey for the basal half its lenght, white for the distal half and other parts of the body.....
C. *albicans* Gray.

FURTHER COMMENTS

Just from *Callithrix albicans* I have got the following data, which are to be considered in order to bring a wider ground to us.

A good glimpse of its placentation is offered by an uterus in the early stage of development.

The organ all over is 21 millimeters long and the placentae were found placed together one against the other in a bulk of nearly 11 millimeters in the greater diameter. The marginal borders were placed in contact one another and the whole seemed to me the two cotyledones of a seed. At about two millimeters of the border of each placental body or cotyledon there was a thick, translucent membrane round all over the inner side of the disk which when separed let see in the botton of the sac so formed the embryo into its membrane but connected with the placenta of the left side by two thin, membranous vessels wich started from the umbilical spot.

The embryo is about 6 mm. in its decurved lenght and the whole pouch into which it floated was 6 mm. in diameter.

This is not all that we deduces from such evidence ; from the up-grown next exemplar we will see that the placentae becomes unequal in growth the outline of one being lesser; and also that the thick membranes becomes layered as in the way shown in the following exemplar of the same species. Opening a gravid uterus at about the third stage of development and taking out the egg we can see the following characters, as sketched in the pl. 7, fig. 1 :

The placenta is double (conjugate) unequal, haemochorial with three membranae the one overlapping the other ; the greater body is right-ventral, of an ovoidal outline, and gives raise to the umbilical cord, thereout we see the ammion (or internal membrane) envelloping the foetus. From the borders of the lesser placenta, which it lines internally the second membrane comes to meet the borders of the umbilical one, there are several couples of vessels, filled up with blood, imbedded into its walls.

It seems to me that such a placentation recalls in some features the explanation given by Hill for *Nycticebus tardigradus ;* (47) opening the egg we can have more details. Indeed, from the sketch just annexed (Pl. 8) and which is to be seen side by side with the photo of the opened membranes after removal of the foetus, we met with the up quoted membranes ; the innermost, the *amnion* (a), was whirled up by me round the umbilical cord, in order to let see the second membrane homologised with the allantochorionic shown by Hill — his text fig. 1 — at the cited page : — only here it comes round the ammiotic sac, lines the discoidal smaller placenta (d) at the dorsal wall of the uterus, as well as the umbilical one.

We can see in it the *decidua reflexa* of Turner & Kollmann, (48) as well as that of *Glossophaga soricina,* as shown by Hamlett in his "Notes" on such bat (49) fig. 16.

Third membrane (e), is shut as in the *decidua capsularis* of the Hamlett's *Glossophaga ;* it performs the small end of the sac (f) very well shown by the annexed photo ; and was found free in the uterine cavity pointing to the *ostium uteri.* The membranous remnants of this decidua, between the placental bodies, were furthermore plainly lining the uterine walls without any placental outgrouths.

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(47) J. P. Hill, "Zool. position and affinities of Tarsius", pg. 477 — P. Z. S. — 1919 ; Trans. Zool. Soc. — 1937.

(48) Oppel. A., Leitf. Embryol. Prakt. pg. 108 — fig. 88 fr.

(49) Hamlett — Notes on the Embryol of a Phyllostomid bat — The Amer. Journ. of Anat. vol. 56, n. 2, March 1935, pgs. 327-350 plates.

It is to be remarked the internal small sac or vesicle, surely a fold of the second membrane (g) which was being resorbed or without any further explanation than excessive cellular proliferation.

It is also to be noted the richness of vessells (h) running in the second membrane from the discoid to the umbilical bodies of the placentae ; and the colour of the decidua vera which is somewhat white papiraceus as that of the chorion instead of fully translucent as in the serosae.

In such way we can see the similarities just quoted and to let the placentation of the *Callithrixes* compared with that of *Glossophaga, Nycticebus* and *Anthropoidea ;* perhaps this may teach us to understand better the placentation of the latter, as starting from that of *Nycticebus* as explained by Hill in the up quoted page.

The foetus also has something of peculiar : In the early squamulation stage, (Pl. 9) it is somewhat Prosimian with prognathous snout ; wide obliquely setted eye-opening, flat, square symphysis. Nostrils lateral, wide set ; mentonian knob ; ears low as with a big lobe into the skin and — short counch ; cleft of the hands as in *Chiropotes ;* nails flat, tail long, weak, with the end whirled, the skin of the end loose.

Head with the high 1/2 of the body's length ; its lenght pratically 1 e 3/5 that of body. Its form is somewhat penta-or hexa-ovoidal in outline ; the muzle is protruding, tappering ; the fronto-nasal line stright, the naso-mentonian do the mentum protruding downwards ; the nares directed sidewards and the eye's opening stright, relatively greater than it must be in the young animal or even in the adult, tighly shut to near the lachrymal corner. From the mentum backwards the profil describes a bow to the neck. Frontal region high, supra ocular region wide and not very much raised from its plan. Malar ridge noticeable over the temporal and maxillary regions, letting the thin, stright and proeminent lips very well drawn. Ear counch high, but having only the upper half free from the skin. Upper and lateral frontanellae noticeable. Nasal, lacrymal and ear-ducts already formed. Brain case swollen, freely sphaeroidal ; parietals squamulated, occipital letting a wide frontanel amidst them. The snout is prominent, transversely dilated with the nares at the sides and the median line depressed. Upper lip very short. Mouth open, hiatus bowed to the sides and tongue perceptible but not protruding over the lower lip which is so encircling the hiatus. Neck short, larynx noticeable from before but not dominant.

Shoulders not wider than head ; moderately placed over the thorax and breast ; scapular crest almost normal to the vertebrae, but axillar integuments and muscles almost envelopping the first third of the proximal part of the

humerus. The skin forms a faint fold before and behind, from the axil to the elbow, where we may see its distention as a faint pro-patagium, from the humeral upper third to the distal one of the radium. Humerus slightly longer than cubitus; olecrana prominent backwards and encircled by the ridge of the skin which comes from the axil behind and finishes under the middle lenght of the cubitus. Hands almost the same length of cubitus. Pisiform dominant, protruding to the sides and backwardly; palms folded in its lenght and the cleft between the second and third fingers. Pads weak and low, excepting that on the pulp which are swollen and compressed; a deep furrow for the cleft from the first finger's base to the radial artery; also the pad for the pisiform the strongest. All nails flat, elliptical, cochlear; neonychium pratically wanting, the under free edge of the nail being subtriangular. Dactylary furrows not well perceptible under weak lenses.

Thorax compressed. Niples — one on each axil. Skin moderately folded thereout to the inguis; a faint fold from the middle of the sternon to the umbilicus. Legs almost equaling the arm, but feet longer; femur slightly shorter than humerus. Pads of the plants weaker; thumb freely opponible; nails flat as on the fingers but that of the index (and 3d.) somewhat contracted at the point. Digits formula I-II-V-III-IV; toes formula I-V-II-III-IV.

Skin of the body all over darkened by brownish pigment and scattered small dots, that of the muzle (round the nares and lips), digits, toes, palms and genitalia flesh — whitish coloured. The bulbous squamulae for the periophthalmic and perioral region, as that of the hands and feet are white; the other dark brown.

Tail somewhat longer than the lenght on the trunk, from its base to the occipital. It is very weak, tapering, but with the last vertebra declined over the main axis, and the distal end a little curled up on itself, as if it was of a prehensil organ. It was also quite free from pigment and of the flesh-whitish colour up quoted. There is a short fold of the skin on the sides, which comes from the glutean region to the tails base. The skin of the end is weak and loose.

Occipito-labial lenght	19,4
Gulo-frontal high	15
From nares to ears	13
Orbital breadth	6
Lenght of the throat	4
Cervico-caudal lenght	34
Tail	43
Arm	19,5

Fore-arm	10,2
Hand	9,5
Thigh	13,5
Leg	11,5
Foot	11,5

Examined under greater power we see the upper lip bordered by three rows of white small tubercles, the two lower interrupted in the middle. Chin with three parallel and short rows of the same tubercles (papillae of the vibrissae) internasal upper region bare, a low ridge thereout to the middle of the frontal region, muzle and eyelids covered by the subepidermal white squamulation which, on the eye-brows are dominant between the orbits, where they make three stright lines more evident ; it is curious to see that these eye-brows pass under the orbital rim of the frontal, oves the eye-lids. On the crown the hairdots are brownish and more prominent, becoming lesser on the nape, cervix and shoulders to increase at the pulmonary and dorso-lombar regions. Increasing the power of the lenses we see that each dot will produce two hairs, bigger than the other smaller dark dots which are seen amidst them.

The squamulation of the hands feet and belly are white.

An other foetus of the almost pre-hatching stage has the following characters and measures :

MILLIMETERS

Occipital-nasal lenght	42 mm.
Gulo-bregmatic high	31
Naso-auricular lenght	23
Palpebrae diameters	8
Ocular one	10
Cervical high	7
Cervico-caudal median line	87
Caudal lenght	93
Arm	29
Fore-arm	27,5
Hand	22
Foot	32

Formula of the fingers — 1 + 2 + 5 + 3 + 4
" " " toes — 1 + 5 + 4 + 2 + 3

The skull is high, shortened, and its outline is about the hemicircular one. The glabella is gently depressed ; the thin shortened lip gently bowed on the sides of the snout, under the quite s-form, oblique, lateral nares, which lay wide apart each other, much wider than the lacrymal corners and separated

mesially by a low pit wich make their fore rim angularly divergent. Orbital border rounded, fore-head high, smooth, without any ridge on the eyes. Ears moderate as if human in shape, free from the skin in a short border of the counch and laying after the middle of the head's lenght, concealed in the lower corner of the counch and obliquely directed downward and forward in a duct of about 3 1/2 mm. long. The opistion-labial line passes through the ear duct opening, and the outline going from the opistion to the shoulders and from the chin to the breast are stright and the fore one acounts for such a shape with the somewhat swollen glosso-hyal region. The head, laterally seen, is fairly prominent both fore and backwards, on the breast and shoulders ; and the antero-posterior diameter of the thorax (19 mm. in this foetus) is responsible for almost the half of the opistion-labial diameter (42 mm.).

The very short neck is somewhat flattened backwards and lets see on its sides and comming from the mastoidean region a fold of skin which has its end on the shoulders, at the acromian region.

The arm is strong, encroached high on the shoulder, with the axillary folds of the skin lower on the breast than that on the back, and coming from the mammary region (and concealing here the teats) to the under third of the arm, in its internal side. Fore-arm also strong but shorter than the arm, with the skin highly loose and wider at the fore border of the elbow. The hands let see the same loose skin in the lower rim if the palm. All fingers with nails slightly compressed at the sides of their base and bowed to the middle of the lenght.

Formula 1 + 5 + 2 + 3 + 4.

The body is stouter mesially than at the shoulder-girdle and pelvis; he dont't let see any ridge of the skin like the foetus first described, only that on the inguis is slightly more developped, as if oedematic, what is also seen in the axillary dorsals fold of the arm.

Thigs short, compressed, wide, with the skin loose with a fold wich comes from above the genitalia to the tarsal joint passing to the legs under their upper third; the legs are weak, but also with the skin loose.

Feet with an external ridge of the skin from the calcaneum to the middle of the fifth toe. Formula 1+5+2+4+3. All toes with the nails somewhat compressed to the base and bowed at the middle lenght.

Tail weak, longer than the cervico caudal lenght, tappering to the end with the last vertebral bony up turned (as in a prehensil organ) and flattened throughout its lenght, with a median furrows in the under side and a ridge of

the skin in more than half its basal lenght. To the end this lateral ridges are on the lower side and go to the base of the last vertebra. A blakish-purple pigment round the lips, nares and eyes on the muzzle, weakening to the sides of the fronto-facial region and darkening to the temporo-auricular one ; newly weakening to the perieto-temporal region and to the shoulders, inner sides of the members, body and tail and darkening to the upper parts of same.

The darkest region are the median line from the occipital to the tail, loins and back of members ; there is a light line from the fore head to the crown. Back of the hands flesh-coloured, of the feet darker. Under side of the thigs (not inner upper one) dark as the leg. Ears the darkest.

Chiropotes HUMBOLDT

Recueil d'Obs. Zool. etc. pg. 314 — 1811 (1815)

Reichenbach has raised this subgenerical name to the rank of genus in his "Naturgeschichte" (50) 1862 and this was rightly followed by Gray in his well known "Catalogue".

This is the most strange genus of the South-American Primates. Its outline show us, in short, a lemuroid monkey, with the tail approaching that of *Daubentonia*, the head of a *Cacajáo* provided with tufts of hairs on the two sides of the skull and a very much developped beard round the face and chin. Going allways on fours and bearing the tail stright and never convolvent. During my trip to the Parecis up-land, I met with *Chiropotes albinasa* ; my notes were published on the quoted paper of the "Commissão Rondon" for 1914 (51). The considerations and data brought forward by Pocock (52) are enough to show that I was right when I claimed there for what he says later "that *chiropotes, satanas,* and *albinasa* cannot be regarded as closely allied to *pithecia, monacha* and their allies". Now I want to draw attention to the low position of the genus which when young has the brain case very much alike to that of the *Saimiris*. Then we have to give stress to Gray when he lets *Chiropotes* as a good genus in the "Catalogue". Only here we have to speak against the *number* of the species, as we have done against the generical key of Elliot letting *Chiropotes* under *Pithecia*. Gray quotes four species which Elliot reduces to three : 1. *albinasa,* 2 *chiropotes* and 3 *satanas*.

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(50) Vollstanding Naturgesch. d. Affen. — Pgs. 72-74 — 1862.

(51) Comm. Linhas Tel. etc. Zool. Mammiferos — Pg. 17 — Pls. 6 (0), 7 e fig. 2, 4 (skull), 8 (fig. 3, 4 do) — 1914. Cherie of the Roosevelt-Rondon Expedition, met with *abinasa* in the Roosevelt's River banks.

(52) Pr. Zool. Soc. London — 1925, pgs. 29-33.

Hermann Meerwarth, (53) dealing with the work of Schlegel and on the ground of the material of the Museum of Pará, was of the same advise in 1898. We have not seen the material of this genus in the British Museum in 1911, and it would be good to hear Pocock on same; but we have followed bibliography and got some material for ourselves.

Sure there are local races as shown by the criticism of Elliot himself and the writtings of Natterer (54).

Whereas to the skins and skeletons in the Museum of Rio we can see the following tabulation :

Size greater :

fur quite black (shining) all over but the hairs on the back to the loins passing into silvery or yellowish gray to the tip as much as the age of the animal is greater ; noose white (rosy in life).

1 *C. albinasa*

fur black (stiff) shining on the distal part of the hairs ; on the tufts of the head and on the tail, they are bronzy-yellow on the proximal half; shoulders and back to the origin of the tail piperate bronzy yellow or only plain bronzy yellow.

2 *C. chiropotes*

Size smaller :

fur black on the back not glossy or shining but whashed with brown ; more so in the female.

3 *C. satanas*

The skins of *C. albinasa* are from Commemoração de Floriano (Chapadão Parecis (♂ & ♀), Coll. Mir. Rib.; Rio Teles Pires (♂ & ♀) coll. Dr. F. C. Hoehne ; Aripuanan 3 (♂ & ♀) coll. E. Stolle ; and Rio Iriri (coll. Dra. Snethlage) the two skins of Commemoração have the back almost uniform black ; there is a plate of the female in the Mammiferos da Comissão Rondon up quoted.

The material of *chiropotes* is from the Catrimany and was purchased (C. Lako). There is some brown on the arms and hands which are black to

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(53) Bol. do Museu Paraense — Tomo II, pg. 138 — 1898.

(54) In Pelzeln — Brasilische Säugethiere — Sitzungsber. Zool. Bol. Gesellschaft zu Wien — 1883 — Pg. 16.

the under side. This pattern of colour is that described by Natterer (numbers 148 b) from Rio Branco. The stuffed skins from the old collections of the Museum are without procedence and believed to be from the neighbourhood of Pará; from Manáos I have the photo long ago sent me by my late friend Carlos Hamann.

Some years ago we have a couple of C. *satanas* from Pará which has been alive for some time in the Museum and therefore I can show here a photograph of same — from life. They were apparently full grown, tame animals but somewhat shy. (Pl. 10).

These last are just a factor which do not agree very much with the Meerwarth's opinion about the diversity of *chiropotes* and *satanas*. The fur of the oldest male exemplar of this last species has the yellowish basilar half of the hairs in a hue which is very much similar to that of *chiropotes* and I feel myself not quite sure if this species should not be the oldest pattern of *satanas*.

Out of such comments we see this genus as realizing the lowest pattern of South-American monkeys because they preserve in the highest degree the fox-tail of *Daubentonia*, the *lemuroid* skull and the gradation on fours in the adult and forteen ribs, notwisthanding the camuflage of the big wiskers and hair tufts of the face and head. Whereas to the teeth we see the same patern as in all other the pitheciinae; *Yarkea, Callithrix, Neocothurus* and *Cacajáo;* the mean outlines in the adult are the same, with the strongly proclives, converging incisives, remarkably striated along their lenghth as if to reproduce the rastriform pattern of their homologues in the Galeopitheci. As a striking counterpart the head and teeth patterns in the young when the tail is the most fox-shaped at all, reccals that of *Saimiri* in a somewhat perplexhing way.

The photo here brought for a glimpse of the feature of the C. *satanas* last quoted, was made from life in my laboratory of the Museum of Rio.

Cacajáo LESSON, 1842

(Reichemb. V. Naturg Affen. pg. 75 — 1862)

There is no question at all to be argued against the genus; only some words about perhaps new data I want to show on a ripe foetus of *Cacajáo calvus*. Pl. 7, figs. 2 & 3, will show to the reader a plenty uterus as seen by its external feature. It has been sketched out as soon as it was opened.

Uterus 82 mm. x 43 ; foetus high of the head 21 ; lenght of the body 42. The foetus was quite smooth and whitish (it must have been flesh coloured). There was a cochlear patch of hairy bulbs at each side of the glabella over the inner corner of eye ; there was also a large patch of four lines of such bulbs in the brow place, over the orbital under margin a linear series of same at the sides of the snout, behind the nares ; a large one round the lips and on the chin — The eyes are shut but the palpebral opening fully indicated. The mouth was opened but the tongue not protruding. Arms compressed, about same shape of the *Callithrix* developped foetuses. Hands tapering slightly recalling the rodents one, nails and pulps well developped. Feet large, nail of the second toe almost globular, somewhat spinoid. The body all over covered by the peculiar small scale like dots seen in the plate of the foetus of *Callithrix*. A male — with the genitalia well shown and the glandular spot at each side of the base of penis — in the same plan.

The animal laid in the uterus as shown in the next fig.

There were two placental bodies one just placed on the left side of the head ; the umbilical cord was directed against the right placental body and turned to the left side from its entrance — there ; the membrane connecting the placentae was in three thin layers becoming available at the borders of the placentae, Pl. 7, fig. 3.

We have given, at the beginning of these comments the words of Palmer on *Neocothurus ;* I have no more than some skins and skulls of this subgenus which proved to be of no much difference from *Cacajáo*. Notwithstanding I can give a glimpse of the animal in life through the kindness of Mr. Lako, who gaves me the next photo taken from life of an exemplar at Manáos 1927. It shows itself from superficial stand point somewhat ateleoid whereas to the shape of the head if we take into consideration the skull and the hairs ; but this is not seen in the photo where it display a very peculiar feature, Pl. 7, fig. 3.

We may summarize the genera and sub-genera of these monkeys as follows :

Callithrichinae

Platyrrhine monkeys with the nares the utmost separated (See Pl. 11) and the snout flat from before. Incisives strongly proclives, close set and converging, intermaxilary do. Mandible of de Callicebinae pattern, not starkly defined. Cleft of the hand between the 2nd and 3d fingers.

Tail about as long as the body,

a) weak, with the fur flufy in the adult and in the young; or fox-shapped in the later; head naked; protected by the hairs of the nape which are directed onward and forming a whorl between the shoulders. Ribs. 13:

1 Callithrix

Sub-genera:

Face almost or quite naked . . . . . *Callithrix*
Face wiskered . . . . . *Yarkea* (P. 11, fig. 2)

b) stiff, fox-shaped even in the adult; head covered by two bunches of hair forming regular separation on the median line and a bright tuft on each side as if combed; a large beard round the chin. Ribs. 14:

2 Chiropotes

Tail shorter than the leg, head naked, or covered with short hairs:

3 Cacajáo

Sub-genera:

Fur flufy, head naked . . . . . *Cacajáo* (Pl. 11, fig. 1)
Fur stiff (ateleoid) head hairy . . *Neocothurus* (Pl. 11, fig. 3)

From the placental stand point they can be included into the Anthropoidean group of Hill because they show two placental bodies.

From the foetal development they prove to be too much connected with the Lemuroid feature; muzle flatened from before, big orbital hole, snout wide and depressed between the wide set nares. Hands small with the fourth finger the longest; descensus Lemuroid-like. Afterwards they under-take the Saimiri shape of skull to finish with its proper form furtherly. From the anatomical side they show a typical construction of nasals and intermaxillary bones; a quite Lorisioid teeth construction and the most aberrant disposition and shape of incisors teeth all of which are longitudinally striped as if compound of three or more cylindroid parts. The mandible is of the Calliceboid pattern since youth but somewhat camufled into the *Saimiri* one, through the strong development of pig-shaped canines. Tail sometimes like that of Daubentonia — gradation on fours.

They show themselves as low-Monkeys as it was allready said by Elliot Smith as regarding their brain.

Whereas to the genitalia they are one step rather more advanced than *Aotus-*; notwithstanding they have evolued downwards.

IV

THE TWO GENERA: *CEBUS* AND *BRACHYTELES*

Cebus Erxleben

Syst. Regni Anim. pg. 44 — 1777

I have written in 1914: "*Cebus*, this is the name we may adopt including the Howlers, since we ought to obey the rules for zoological taxonomy. Allen "On the names of Mammals given by Kerr in his Animal Kingdon published 1792", says *Sapajus* of Kerr *almost* a synonym of *Cebus* Erxleben. Slack in his "Monograph of the Prehensil tailed Quadrumana", takes *Sapajus* as meaning *Ateles*, after Lacépède, 1800. Trouessart took *Alouatta* Lacépède and the same is done by most modern authors. All the animals included by Erxleben under *Cebus* are not of the same kind. But the two first quoted ones — which may be taken as types were: *Cebus belzebul* and Cebus seniculus, two howlers of the northern Brasilian Fauna" (55).

And more: "We cannot accept the name Cebus Erxleben, 1777 in the same way done by most authors, because this name must be employed to signify the howlers. *Cebus* Erxleben has two genera quoted together, the howlers (Cebus) and the Coatas (*Ateles*) before the first *Caiarara* was listed over" (56).

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(55) Comm. de Linhas Telegraphicas, etc., pg. 5 — 1914.

(56) Idem, pg. 12. We see since Humboldt that Cuvier, Latreille and Dumeril had already restricted this generical classification: "Les noms de *Cebus* et de *Callithrix*, choisis comme au hasard, ont eté appliqués dans la suite à familes de Singes très differentes. Le genre *Cebus* d'Erxsleben renferme à la fois les Alouattes, les Sajous et les Atèles; tandis que le genre *Cebus* de Cuvier, Lattreille et Dumeril (Latr. Hist. Nat. des Singes, T. II, pg. 297; Cuvier, Leçons d'Anat. Comp.., Tabl. I; Dumeril Zool. Anal., pg. 8) designe au contraire les Heurleurs seuls". (Humboldt — Tableau des Singes de l'Amerique — pg. 363 — (1811) — 1815.

Alouatta, Lacépède, has been rejected by Etienne et Isidore Geoffroy de Saint'Hilaire as synonym of *Ateles belzebuth* — because its type was the same of Brisson (Mem. Sur les Singes à main imparfaite ou les Atéles, Annales du Musée d'Hist. Nat. — pg. 261 — et 272 — 1806); et Dictionaire des Sciences Naturelle de D,Orbigny, tome Ier, pg. 294 — 1841 e tome VI eme, pg. 715 — 1845. Whereas to the genus itself Alston also is of the same advise because the name is under the Rule XII of the Stricklandian Code (Biol. Centraliamericana — Mammalia — pg. 3 — 1879). Of course Isidore Saint-Hilaire claims for its synonymy on the ground of priority under *Cebus* Cuvier et Etienne Saint'Hilaire, Encyclop. Methodique (1795) The same Dictionary, pg. 716 — 1845; and De Blainville, Osteogr. I, pg. 8 — 1839).

The Caiararas are the true Capucin Monkeys which must be called *Pseudocebus,* as restricted by Reichenbach at 1862.

Pocock pays special attention to the howlers, sparing them into a sub-family rank (*"Alouattinae"*) from the Atelinae (*Ateles, Lagothricha* and *Brachyteles*) under the development of the hyoid bones; let us read his words :

> "The kinship of Alouatta is not easily determined; but so far as the external characters above discussed are concerned, the following points may be noted : — The tail is like that of *Lagothrix, Brachyteles,* and *Ateles;* the hand is like that of *Lagothrix* and *Pithecia* or *Cacajão,* but the foot is not long as compared with the hand, as in the last two, but short as in *Lagothrix*. The nostrils are comparatively narrowly separated as has been stated to be the case in *Brachyteles*. The ear, it is true, retains its primitive freedom from the skin of the head and is not basally confluent with it as in *Lagothrix* and some species of *Ateles;* but since this character varies within the limits of the genus *Ateles,* it has no great importance in the present connection. The male genitalia are unknown to me; but the vulva and clitoris do not differ greatly from those of *Lagothrix*.
>
> In the sum of its external characters therefore, I can find no structural peculiarities justifying the severance of Alouatta from the Atelinae. But the claim of the genus to hold a place apart in a special sub-family or family rests upon its skull and hyoid bone. It appears to me to be probable that the modifications of the skull are correlated with the well-known and extraordinary development of the hyoid bone. The mandible is exceedingly massive, with a long symphysis and receding chin, the ascending ramus being especially high and expanded, with an evenly curved posterior border. Correlated with the height of the mandible is the upward tilt of the cranial portion of the skull, so that the plane of the occiput is nearly vertical and the plane of the basi-occipital, basisphenoid and presphenoid, instead of sloping upwards from the foramen magnum behind to the posterior nares in front to form an obtuse angle with the basifacial axis, is approximately horizontal and in line with that axis. The results of this modification is that when the cheek-teeth are resting upon a flat surface the occipital condyles are raised high above it. In Lagothrix, Ateles, or Brachyteles, on the other hand, when the cheek-teeth are on a flat surface, the occipital condyles also rest on that surface. These and other differences, such as the lower crown and occiput, obtain both in male and female skulls; but most of them are much less pronounced in the female than in the male. If the less-modified female skull be compared with that of *Lagothrix, Ateles,* and *Brachyteles,* it does not seem extravagant to claim Alouatta as a divergent genus of that stock, differing mainly therefrom in the huge expansion of the hyoid and the cranial modifications correlated therewith. (57) The teeth of Alouatta are not very different from those of Bra-

(57) "The skull of a young *Alouatta,* with the first molar already fully in use, differs very little in general conformation from adult skulls of *Ateles,* or *Brachyteles,* the upper surface of the cranium being well arched, the occipital plane inclined, and the basicranial axis also more inclined than in the adult".

> chyteles altought the *molars and premolars are relatively larger, and the last lower molar has a larger "heel". Alouatta, indeed, stands alone amongst the Platyrrhini in having the last lower molar longer than the first"* (58)

This is just the true picture of the case; as the author says "to have been only dealing with dryed skins", in the words on the narrowness of the nostrils, (59) I am appending herewith the plate of the face of a freshly killed howler of Therezopolis — State of Rio de Janeiro — *Cebus fuscus*, as afterward an other of *Brachyteles*, (Pls. 12 and 13).

As he says, it does not seem extravagant to claim the howlers as a divergent genus of that stock (Atelinae) I ought to remember what the development shows from the foetus to the full grown.

I had said that the Platyrrhine Monkeys are pratically devoid of well-developped eye lashes and eye-brows, taking the hairs at place in *Brachyteles* as *vibrissae* (60).

The photo here appended and just quoted shows the howlers giving evidence to my words.

Notwithstanding we will have in the foetus stage of pigmentation the very clear distribution of such future vibrissae as shown in photo of the Pl. V-2a and 3 P. Z. S. 1935 January 1936. Photo 3 (same paper) — will show a better development in the post squamular stage of the skin and we will have the same vibrissae arrangement in the adult of *Brachyteles* with the surplus of strangely develloped eye-lashes.

If we take the skull of the young howler before the swelling of the supra-orbital rim, we will have the skull of an young *Ateles* with the mandible somewhat similar, as is well sayd by Pocock and shown by Schultze, Zoologica pl. III Dec. 1921. If Pocock had not emphazised the massiviness of the mandible of the howlers it must be done as the last result of the true divergence which makes the dichotomization of the *Cebidæ*.

Indeed when we take into consideration a serial number of skulls of such monkeys, including all genera of the so called "*Cebidae* and *Hapalidae*", we will met with the cranial divergences which mean these genera and which

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(58) Pocock, R. J., — Additional Notes on the External Characters of some Platyrrhine Monkeys — Pr. Z. S., Part. I, 1925 — pg. 44 (Italics mine).

(59) Do — Pgs. 43 and 44.

(60) Pr. Zool. Soc. 1935, pg. 743.

do appears chiefly in the mandible and teeth, into two very clearly defined directions, viz : —

I The *Hapale, Saimiri* and *Pseudocebus* pattern where we meet with the flat mentonian symphysis and stout tusks of *Pseudocebus* and *Lagothrix*.

II The *Ateles* — Brachyteles patern, with an isomorphic pattern for the teeth, and the imposing growth of the mandible in the howlers and titis From theese two main shapes of teeth and mandibulary bones, that of the flat mandible being moreover only found in the old-world monkeys, we may found the lowest type in the *Chiropotes,* included in the so well defined Pitheciinae of Pocock which I name *Callithrichinae*. (See this paper, part. III).

Most authors will exclude Lemurs from the philogeny of the Platyrrhine monkeys ; here we will met with the true Lemurinae starting point for them in the Yarkea and Chiropotes ; the incisives high, converging and forwardly laid ; the very narrow inferior ones ; the big diastem between incisives and canines, are recalling the same disposition of such teeth found in Lemurs. From an other side the divergent canines are just stalked in the alveolar sockets in the mandible, as are placed the incisives of the bats of the *Pteropidae* family.

To this *bat pattern* of under canines which makes the flat symphysis of the mandible, we will get an older charater if we search for young skulls of the *Yarkea,* where we will meet the incisives strightly striated, as if being composed of three or four longitudinal branches. If this fact, from one side calls our mind to the words of Roth, (61) on the compound origin of the incisive of Ungulates and Primates, brings also to our view the especial tooth pattern of the incisives of the so well called, by Thomas, Flying — *Lemurs* or *Galeopitheci*.

But this is again an evidence against the division of the Platyrrhine monkeys *into families*. Their characters are so intermingled which other among them that is quite impossible to have them considered in sections more prominent than sub-families ; that is to say, there is not possible to consider them older than the old world monkeys, which have had the necessary time to evolue in more positive features.

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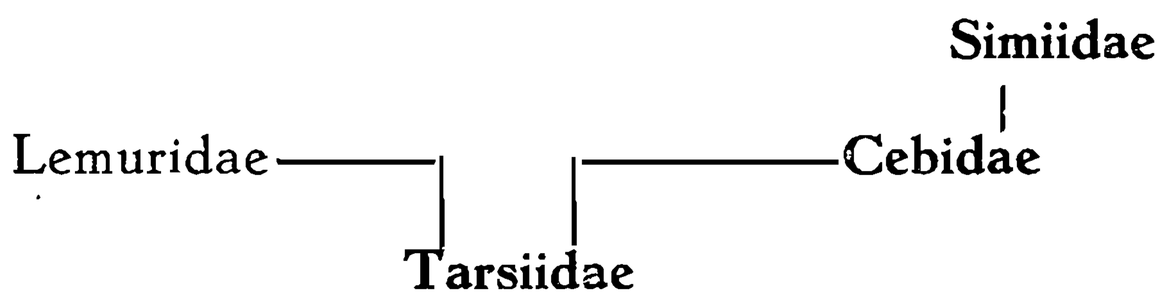
(61) Revista del Museu de la Plata — 1927 (Edited by Prof. Miguel Fernandes.

I take from Winge the remarkable words :

> "Among other *Cebidae*, only *Mycetes*, through the wide distal end of the humerus, may be compared with *Eriodes* (*Brachyteles*) which, on such a peculiarity, is like the *Simiidae* having the arm the most freely moveable : *Hylobates, Homo, Simia* and *Pithecus*". (62)

On this and other characters he has stated the phylogeny of all Primates as comming from the *Tarsiidae* viz :



He is more akin to explain the connections of the genera of Cebidae (as allready cited by Pocock :

I) Brain lesser, lumbar vertebrae longer

A) m.3 present. Nails

Mycetini

Tail not prehensil. Hyoid allmost normal.

Lower incisives normal.

Callithriches (*Callicebus, Aotus*).

Lower incisives directed forward

Pitheciae (*Pithecia, Cacajáo*).

Tail prehensil. Hyoid transformed

(Mycetes (= *Alouatta* auctorum)

B) m.3 wanting. *Nails becoming claws* (63)

Hapalini — *Midas, Hapale*.

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(62) "Parmi d'autres Cébidae, il n'y a que le *Mycetes* que, pour la largeur de l'extrémité inferieure de l'hemurus, puisse se mesurer avec *l'Eriodes*, qui sous ce rapport rapelle celles des Simiides qui ont le bras le plus librement agiles: *Hylobates, Homo, Simia* et *Pithecus*". H. Winge, Jordfundne og nulevend Aber (Primates) fra Lagôa Santa — Minas Gerais — Brasilien — E. Museo Lundii — 2 — III — pg. 48 — 1895-6.

(63) Italics are mine.

II) Brain larger — *Cebini*
Tail without tactil end
(*Saimiri*). *Cebus* (auctorum).
Tail with tactil end
Ateles, Lagothrix, Brachyteles (64).

He has even clearly stated the question as giving to an early *Cebidae* the stem — in the old-word — of the Simiidae, whose low members which are more related to the *Cebidae,* are found to be represented into a very restricted number of forms of a particularly elevated development : *Hylobatas, Homo, Dryopithecus, Simia* and *Pithecus* (65).

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(64) *"Cebidae*

I Cerveau, plus petit. Vertèbres lombaires plus longues
A) m 3 se trouve. Ongles plats. *Mycetini*

a) vertèbres lombaires, longues; leurs apophyses epineuses, ordinaires; la queue n'est pas prehensile. Os hyoide plus ordinaires.

1 Incisives inferieures, ordinaire. *Callithriches*: *Callithrix, Nyctipithecus.*
2 Incisives inferieures dirigés en avant *Pitheciae*: *Pithecia, Brachyurus.*

b) Vertèbres lombaires relativement courtes; leurs apophyses epineuses en form de crête; queue prehensile. Os hyoide fortement transforme *Mycetes.*

B) *m* 3 fait defaut. Ongles redevenus griffes.
Hapalini: *Midas, Hapale.*

II Cerveau plus grand, Vertèbres lombaires le plus souvent plus courtes. *Cebini.*

a) Procès ento — et ecto — pterygoideus séparés. Queue sans extremité sensitive. Extremité inferieure de l'humerus etroite *Cebi*: *Chrysotrix.*

b) Proc. ento et ecto — pterygoideus réunis à leur base. Queue munie d'une extremité sensitive. Extremité inferieure de l'humerus large: *Ateles*: *Lagothrix, Ateles, Eriodes".*

H. Winge, op cit. pg. 54.

(65) "Les Cebidae, elles aussi, tirent leur origine des Tarsiidae d'ordre inferieure. On ignore leur premier habitat; mais il est permis de croire qu'elles sont originaires d'une region commune à l'ancien monde et à Amerique du Nord; leur histoire anterieure est encore presque inconnue. De nos jours, elles peuplent l'Amerique du Sud. Cest la qu'elles ont constitué un cycle des genres rapprochés l'un de lautre. Un des genres les plus infimes, cest le *Callithrix,* de la section des Mycetins. Un genre qui s'en est trouvé rapproché, bien qu'inferieur à lui, a fait rayonner en divers sens des genres tels que *Nyctipithecus, Pithecia, Mycetes, Midas* et *Chrysothrix,* genres qui sont en partie redevenus types originaux d'autres genres. Le Pithecia ou son proche parent, est devenus de point de depart du *Brachyurus;* le *Midas* est devenu de même l'origine de *l'Hapale,* et d'un parent inferieur du *Chrysothrix* sont issus, en un sens, le *Cebus* en un autre, les *Lagothrix, Ateles* et *Eriodes*. On a trouvé, à Lagoa Santa, des genres de toutes les sections principales, datant et du passé et du présent. Un Cébide primordiale a fait naitre dans l'ancien monde les Simiides, qui d'abord sont allés ce répandre sur l'Europe, l'Asie et l'Afrique. Quant à la section la plus infime, savoir les simiens, qui sont les plus rapprochés des Cebides, on n'en connait qu'un petit cycle de genres d'un developpement particulièrement elevé; ce sont les *Hylobates, Homo, Dryopithecus, Simia* et *Pithecus,* genres qui sous beaucoup de rapports en sont arrives à un rang plus elevé que tous les autres Singes, toutesfois abstraction faite des qualités d'après lesquelles on doit distinguer entre les sections principales des Simiides. La section des Cercopithecus constitue une serie serrée de genres relativement infimes: *Cercopithecus, Semnopithecus, Colobus, Macacus* et *Cynocephalus.* Un seul des genres des autres, a emigre, de son habitat originaire dans le nouveau monde, probablement par la route ordinaire, d'Asie dans l'Amérique du Nord: des les temps prehistoriques y il a eu des hommes à Lagôa Santa où l'on a trouvé de leurs os dans les cavernes". Herluf Winge, E. Museu Lundii, 2 vol. 2 tomo 1895 — pg. 56.

His work is based on the material chiefly of Minas Gerais — Lagôa Santa — The South-American Monkeys are incorporated in one family : *Cebidae*.

That is to say he gives three sub-families of the same animals which we have seen tabulated into five sub-families by Flower & Lydekker and seven by Gray.

It is very interesting to know that in the remark 23rd Winge claims for Homunculus — *"the upper miocene"* monkey of Ameghino, as a relative — "from the pm. is a *Mycetes ;* from the mandible" — is early to the genus *Mycetes,* (66) (= *Cebus* Erxleben).

We do know that this fossil has raised to much noise and even determined the expedition of Bluntschli, from the Anatomical Society of Leipzig to Argentina for the sake of stating the *"Homunculus* Fraqe".

Before Bluntscli, Schlosser, Weber and others have given their word to the matter — and all these authors are not very far of Winge's conclusion. Also very much important is now the word of Cabrera, who works now near the same material of Ameghino — and who has left in his "Manual":

> "The Platyrrhini do appears in the upper miocene of Argentine with the genus *Homunculus* which is to be assigned to the *Aotinae ;* and the living genera *Callicebus,* Alouatta (= *Cebus* Erxl). and Cebus (= *Pseudocebus* Reichenb.) come from the pleistocen". (67)

So we have two very important opinions :

"Homunculus is a *Mycetes,* with an early lower jaw".

Winge, Bluntschli (part,the last tubercle of m3).

Homunculus is an *Aotinus*

Cabrera ; Bluntschli (part) from the skull : "In groszen ganzen stimmen gut mit *Callicebus* "uberein" ; from the lower jaw "mit *Aotus*".

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(66) Op. cit., pg. 40 — danish text. *"Homunculus* er den, der kjender bedst, efter et stykke Unterkjaebe, der blandt andet ret tydelig viser tre Forkindtaender hvis Form minder ikke lidt om *Mycetes ;* selve Unterkjaeben er derimed mere oprindelig formet and hos *Mycetes"*. *"Homunculus* which is better known trough a piece of lower jaw showing, amongst other things clearly three premolar teeth, the shape of which recalls not few of that of *Mycetes.* The lower jaw is notwithstanding of shape early of that of *Mycetes".* (Translation by courtesy of Dr. Fred. Greenberg).

(67) "La primeira (platyrrhini) aparece en el miocene superior de la Argentina, con el genero *Homunculus* que corresponde a la subfamilia *Aotina.*

Los generos vivientes *Callicebus, Alouatta* y *Cebus* datan solo del pleistoceno". Cabrera, Manual de Mastozoologia pgs. 287-288 — 1922.

Indeed, the meaning of Winge is not devoid of ground if we take into consideration the fact that "*several pieces of the mandible* do let evidence to the reconstruction almost without fail of that bone" (68).

First, the outer shape reproduced in the drawings of the various papers of Ameghino in the matter, seems to show bones of not yet full-grown animals at least so speak the swelling of the symphysis in some ones; second, the shape given to the mandible by Ameghino — in the "Formationes sedimentares de Patagonia" (69) — is not without similarity with that of an young of Brachyteles (70) or at least *Ateles;* third, the sub-parallel disposition of the mandibulary borders may be found in this genus, just to the growth of the last molar in the young male; fourth — the shapes of the teeth are very much alike. (See Ameghino's fig. 324 face pg. 574).

We do not know if Ameghino or Bluntschli could have articulate such a mandible with the maxillary part of the known skull; the figures given by Ameghino are "of nat. size" (mandible and skull); of both this pieces I have samples of young *Cebus caraya* Humb., and *Cebus beelzebul* (L.) many mandibles of *Ateles* (chiefly females) theese almost corresponding to the drawing of Ameghino — and a copy — of the skull of *Homunculus* sent over by the Museum of La Plata and lent me by Dr. Bastos d'Avila of the Anthropological Section (See plate 14, figs. 1 & 2).

From that copy, I am not authorized to agree with Ameghino who has compared the skull with that of *Saimiri*. If from the mandibular "praeparat" after Bluntschli, we would be led to see in it the m3 of caraya (pg. 37) and similarity with *Aotus* pg. 36, what is not the case at all, from the copy of the skull there is not only "a good similarity with" but a very pattern for the skull of *Callicebus*. (See Pl. 14, figs. 1 to 4) I do not know why Bluntschli has not taken into consideration the wide palatal bones and the lenght and width of the tooth row. He says:

> "The fragments of the teeth of the upper jaw are infortunately of secoundary systematic value, because for the most of them the crowns are broken at the cingulum. What the "praeparat" shows, do not speak at any rate against the parallelism to the living Cebiden". (71)

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(68) *"Die verschiedenen Unterkieferstücke gestatten eine beinahe lückenlose Rekonstruction der Mandibel".* Bluntschli — Die fossilen Affen Patagoniens, etc., Verhandl. Anat. Gesellsch, in Greifswald — Vom 10 bis 15 Mai — 1913.

(69) Edition Oficial — Alfredo Torcelli — Pg. CLXXVI, fig. 329 — 1934.

(70) It is known that Gervais and Ameghino have found a *Brachyteles buonairensis,* which may be brought into the discussion.

(71) "Die Fragment der Oberkieferzahne sind systematische wenig verwerthbar. Die kronen sind meist am Halse abgebroken. Was der Praparat zeigt, spricht in Keinen Punkt gegen die Paralleliserung mit rezenten Cebiden". Bluntschli — Op. cit. pg. 37.

Notwithstanding the matter seems not to be that : I-From the Ameghino and Woodward-Zittel's drawings we have an upper tooth row measuring 22 x 4mm.; which is within the *Callicebus'* mesure ; in the mandibulary row we have 24mm., both from m3 to c; 27mm. from the last molar to i^1 in the skull and 29mm. x 3,5 in the mandibulary row ; both figures are said in "natural size" of "old" or "very old" animals, and I fear these two teeth-rows can not be articulated. II - Furthermore Ameghino reproduced in his fig. 330 the lower molars of *Homunculus* magnified four times (perhaps x 3, x times ?) in order to show the pattern of the crown of every molar — which is evidently found in the not quite full-grown mandibulary molars of the genus *Ateles*. See Pl. 14 and 15, here appended.

Fig. 330 shows teeth not yet used ; and this is not evident from the fig. 329 a. And fig. 332 (pg. 579) lets see the lateral outline of the fifth molar tooth, outline which do not stay very far from the corresponding one of *Ateles paniscus*.

There is a diastem between the canine teeth and pm_1, from the hind side; and between the same teeth and the incisive in the oposite one. Such diastems do not exist in the skull as it can to be seen from the photo of the copy (Pl. 14, fig. 3). Canines and incisives seem to be the teeth of a lactant animal when compared with same teeth of *Ateles* (See Pl. 15, fig. 3) notwithstanding the rate and disposition of molar and premolar very much alike to their corresponding of *Callicebus personatus* (See Pl. 15, figs. 1 & 2), make grew an intimate feeling that such a mandible is effectively an intermediate one, or an intermediate stem between *Callicebus* and *Ateles* which can be the so called *Homunculus*.

If both bones are of the same animal we will have in *Homunculus* a generalized type as we have seen in *Callimico* which makes a good parallel to the outlines ; if, on the contrary the future will disprove this, there is not any extraordinary fact in bringing the bony pieces to the proper owners — that is the genera *Ateles*, Geoffr. and *Callicebus*, Thomas.

That is to say as far as the mandible and mandibulary diastems of the teeth recall the *Ateles* pattern, the skull brings our mind to recognize the typical features of a *Callicebus*, therefore the question deserves to be reexamined, in order to overthrow any doubt.

Bluntschli says again :

> "It was described by Ameghino in the molar of the mandible a fifth tubercle (the so called posterior intertubercle) ; and this assertion was referred by Schlosser as bringing the Patagonian Primates into connection with his Primates of Fayum. I ought claim that there is not a fifth tubercle. This contradiction is brought in evidence also by the form of division which do not let any sign of that. And because the

second molar had the trituratory reliefs at sight and well preserved. Ameghino was mistaken by them for I have found there a local thickness very slight, only, visible in the posterior rim of the tooth, between the two posterior tubercles, somewhat nearer of the internal tubercle; and noteven seems distinct at any rate from near that or from the external one. It is only one of these slight complications of the posterior rim of the crown which are found, for instance, frequently in *Mycetes*. It cannot be considered as tubercle because it is even only one very superficial structure which is let to be shown in the groups of foldings of the enamel which pass through an autonomous base. Who has seen the original of *Homunculus*, cannot doubt that this form — not at all has to be seen with *Propliopithecus* and other Primates of Fayum — what the teeth give evidence". (72)

Since Thomas that we are shecked by such words of Bluntschli. Indeed what we read on the over discussed *Callimico* at the very discussion of its characters is :

"Molars, although less narrow, essentially of the triangular type of those of Marmosets, the internal cingulum well developped, but with no distinct hypocone, the development of this cusp being what causes the characteristic square form of the molars of the Cebidae *and other monkeys*, including man". (73)

Also Schlosser's opposition to the words of Bluntschli, came from the comparison of the teeth of *Propliopithecus* as we see the Broili Schlosser's figure 793 of the new Zittel (74) the teeth of the *caraya* when young enough to preserve the transverse folds of enamel, the molar row of *Callicebus* or even the premolar of *Callimico*. The patterns *Microchoerus, Homunculus, Callicebus*, seem to me much more evident, than any divarication as seen by Bluntschli.

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(72) "Von Ameghino ist an Unterkiefer molaren von *Homunculus* ein funfter Höcker (sogennanter hinterer Zwischenhöcker) beschrieben worden und diese angabe hat Schlosser veranlasst, seine Fayum primaten imgevissem Beziehungen zu der patagonischen Primatenform zu bringen (Beiträge zur Kenntniss der Oligozöhnen Landsäugetiere aus den Fayum (Aegypten) Beiträge zur Palaeontologie und Geologie, Ostenreich, Ungarns, Bd. 26, 1911). Ichmusz betonen dass ein funfter Höcker nicht besteht. Es beweisen dies einward frei namlich, auch die Alschliesformen, die keine Spur eine Solchen erkennen lassen. Und was den zweiten Molaren mit intakten Kaurelief anvetrifft, auf den sich Ameghino gestützt hat, so vermag ich nur eine lokale ganz leichte und Kaum sicht bare verdickung an hinteren Zahnrand zwischen den beiden Hinterhöckern festzustellen die den Innenhöcker etwas genahrt sitz und weder von diesem noch den Aussenhöcker irgendwie sharf abgezetst erscheint. Es handelt sich um nichts anderer als eine leichte Komplication hinteren Kronerand, wie sich solche z. b. bei *Mycetes* ebenfalls öfters findet. Als Höcker kann sie nicht bezeichnet werden, denn es ist eben nur eine rein oberflachliche bildung, die whol in die grupe der Schmelz falten zu stellen ist, und der eine selbstandige Basis voll und ganz abgeht. Wer der originale von *Homunculus* gesehen hat, Kann nicht im Zweifel sei, dass diese form mit *Propliopithecus* und den anderen Fayumprimaten, dasz die Zähne betrift, absolut nicht zu thun Hat". (Bluntschli, op. cit. pg. 37). (Italics mine).

(73) Olfield Thomas — Annal & Mag. Nat. Hist. 8 Ser. vol. 11, pg. 132 — 1913.

(74) Grundzuge der Palaeontologie — Vertebrata — Pg. 652 — 1923.

A third perplexity is produced in our minds when we look at the very similar shape of the brain case and face skeleton of *Libypithecus* (75) and that of the caraya monkeys. If we consider *Brachyteles* the highest type, as did Winge, after all, we have to see that the South-American monkeys are all growing from the low type of the Tarsioids to the especialized one of the *Brachyteles* — as is also clearly shown both by the shape of the mandibular bones and by embryology (not known in the last genus). In such way I do not understand as starting from highly quadrumana, as the Tarsioids, it is possible to see marmosets as primitive and not modified small monkeys. To the constitution of the fifth molar tubercle it comes again nature to let us in doubt. Indeed if we look at the mandibular tooth row of *Brachyteles* (since Bluntschli has discarded the Caraya) we will met the 2° and 3d molars with the same specialized tubercle he has denied to *Homunculus* and to the words and drawings of Ameghino; it is true that this tubercle is found even in *Callicebus* which Winge placed into the lowest *Cebidae*, and that the teeth of the *Callicebi* recalls *Microchoerus*. Whereas to the mandible, I have said up that its shape diverge into the pattern which goes with *Callimico, Saimiri*, the Marmosets and *Pseudocebus* from one side; and with *Aotus, Callicebus, Brachyteles*, the howlers, from the other. That is to say: While this bone preserves the same or similar shape in the first ones *as in the apes*, it undertakes a spreading of the angulare as if to remember more and more the Lemurida's one — or even going to the same shape of the ungulate *Oreodon* or even *Procavia*.

In the first quoted group, the mandibular symphysis becomes flatish, the canines grow up into strong tusks; in the second the symphysis is embryonaly rounded, and the extraordinarily grown angulare of the lemuroids is concealed into the bony mass, wich becomes rounded from it, backwardly, into a discoid lamella to the antrorse condylar bone, to which is approached the coronoid process.

I understand these mandibular characters of the second group not only forced by the development of the hyoides, as did Pocock, but also connected with the exclusive herbivorous diet, what is also shown by the specialisation of the intestinal tract. The caeca of the howlers, *Brachyteles* and *Ateles* are so developped as to be greater in its bulk than the stomach itself; (76) sometimes it is even connected to the last by a ligamentous band, surely for avoiding troubles from their variations of weight.

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(75) Abel — in Weber's 2te Aufl. II ter Bd. pg. 833, fig. 572 a & b — 1928.

(76) Miranda-Ribeiro — Mammiferos da Com. Rondon — Pg. 12 — 1914.

The skeleton of all that bulky monkeys with long, strong and prehensil tail, is also modified on the purpose of helping the arms when the animal is hanging from the branches of the trees, in order to make their leaps sure and cautiously to protect the body from falling down at every leap; but therefore the tail vertebrae are modified, having strong neurespines and haemal ones at the basilar third of the organ — all directed backward.

This exhibition of facts show that there is not only a parallelism as claimed by Blunstschli, but a more properly self-specialisation into the herbivorus and leaping directions and therefore a true divergence, evolued from the basilar or lemuroid stock.

That is to say, the *Cebidae* are fit for showing us that they have not succeeded with the arboreal life; they do not go into the true anthropomorph way, but on the contrary, they are a modern evolved branch from this same stock to their higher forms, without further connections with the true apes; the Platyrrhine monkeys are a segregated, lowered geographical group of Primates. The evolution of the caraya monkeys is a very clear one: they begin with an orthognathous face and a rounded skull, they pass from there to the prognathous face, with an up-bowed upper maxillae and ovooblong brain-case; if it has the same hand cleft as *Chiropotes,* as claimed by Pocock, it is surely because both they have evolved from the same stock, what is also supported by the second stage of the skull of the young at the growing of the first true molar tooth; and by the nasal bones which are transverse and abruptely started from the midle of the interorbital process of the frontal bone in the full-grown, just at the level of the middle axis of the orbitae, and do not finish tappering backwards as in *Homunculus, Saimiri, Brachyteles, Callicebus* etc. Also it is only in the howlers where I have found the nasal ending proximally in a somewhat expanded end, between the lachrymals and remembering trough its shape that found in the *Didelphiid* or *Marsupials*.

So, the howlers evolution is fit to demonstrate that they are very specialised monkeys, as allready stated by Pocock; and that its secondaries shapes of evolution show connections with *Chiropotes* but its earl skull bring them to the orthognathous shape of *Tarsius* or *Tectonius,* instead of letting them brought home into the true Lemurine pattern alone. This is a secondary path or stage of development and growth.

Perhaps a collateral inheritance, as it is known in genetics; notwithstanding they are degenerate animals which should ought to grow up from the orthognathous stage of their youth, instead of to low into the lemuroid skull of the full-grown, with a lesser brain and with the brain case at about the same level of the highly prognathous maxillary bones.

Their degeneration do not stop there ; all we know the kinship of forms which had struck Vic d'Azir when taking the Quadrumana into the Pedimana. Here we remember also that the Marsupials in shutting the mouth let the external series of maxillary cusps out of contact with the mandibulary tooth row ; that is what we can see when regarding a skull of a howler with the mandible at place, from beneath ; there then we can understand why the upper maxillary have so developped longitudinal crests at the cingulum, with apparently sporadic external tubercles, recalling the same case already know to the Marsupial pattern and up remembered.

All authors who have dealed with philogenetic side of the question, are unanimous in saying that the starting stem of the Platyrrhine is the Tarsioid one.

Tarsius is a quadrumanus animal, it has also the molar teeth 3/3.

Then, if I understand logic, the Platyrrhine bearing nails and molars 3/3 are more akin to the primitive stem than the Marmosets.

This must give a natural answer to the question of high and low, or say that they are much specialized forms. And if we will look at external features for serial measures, the Marmosets exhibits again some Lemuroid ones as the ear tufts the annullated pattern of colour of the tail. On the other side, the modified feet and the lost of the last molar, let them as an undeniable decurrent from the group as is also supported by bi-placentation (77).

An other indeniable fact is that they preserve not allways, indeed, the paralleled mandibular bone as the capucins and apes, and that the surface of the crown of teeth is quite smooth, like in same animals. All this plus the gradative type of *Callimico*, renders untenable the division of the South-American into families.

Santiago Roth speaks on the modern character of the Cebidae (78).

What we have just finished to say is also converging to the same result, the evidence of which is fully supported by actual Palaeontology.

If we have to speak based on facts, the South-American Monkeys are one of the best evidences on the relative youth of the fauna of the South-American Continent, and we cannot understand how to built any bridge to meet the other rims of the globus, in order to connect parental kinships, than

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(77) Dr. Paulo Sawaya, sobre o placenta bidiscoidal de Hapale jachus (L.) Rev. Biol. e Hig. 7 (1) — 53-58, Agosto, 36 — 2 figs. See also Sir Frank Collyer — Variations and Dieseases of the teeth of animals — Pg. 61 : "absence of teeth is more common than extra teeth and molars are more variable than the other teeth". Numerical variations in the New World Monkeys 1936.

(78) Rev. Mus. La Plata — 1927,

that shown by Mathews in his "Climate and Evolution", into a group sui-generis in the shape and evolutionary development.

Indeed, notwithstanding the photo here exhibited of *Brachyteles,* I do not know if we would be right calling this monkeys a "Catarrhine".

Awaiting for embryology I would prefer let him aside and to have *Saimiri* as the Platyrrhine genus the more properly outlined at the old-world monkey's fashion, notwithstanding its wide snout. Sure, it would be let into the old-said *Cercopithecidae* if regarded in some features of the body and tail. or even nearer to the Gibbons — if for the maxillary region — if found in the Asiatic Ground.

Brachyteles SPIX

Simiarum et Vespert. Brasiliae Nova spec., pgs., 36-38 tab. XXVII, 1823.

One feels here because Winge has placed *Eriodes* (*Brachyteles*) at the end of the key here appended to the page 816; surely it must be for him a very near genus if not the same in which must be found the forerunner of the European Simiidae.

We have seen that he has said that *Callicebus* is the lowest genus ; and that the other one found to be near ally, but lower again, had given the stock for the "rayonnement" of *Nyctipithecus, Pithecia, Mycetes, Midas* and *Chrysothrix ;* — such lowest form must be, I believe, the genus *Homunculus* of Ameghino what has been the suject of the 23 rd remark of Winge's paper, and is surely the "low Mycetin" he is meaning.

Hence we have the result that Winge was about of the same phylogenetical thought of Ameghino — lesse the *Prothomus* question, because, he has cleared that *Homo,* had migrated from Asia, probably through the ordinary routh into North-America, since the prehistoric times (79).

I agree fully that the South-American Primates came directly from the same forerunners of the Tarsiidae; I have even writen this many times; (80) I agree that *Brachyteles* is a relatively high member of the Cebidae owing its bulk and nature of its brain ; I would like to agree that *Homunculus* is the

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(79) "Un seul de ces genres des Simiides, *Homo,* celui qui sous le rapport de l'intelligence depasse de beaucoup tous les autres, a emigré, de son habitat originaire, dans le nouveau monde, probablement par la route ordinaire, d'Asie dans l'Amerique du Nord. Dès les temps prehistoriques, il y a eu des hommes à Lagoa Santa, ou l'on a trouvé de leurs os dans les cavernes".

H. Winge — Op. cit. pg. 56.

(80) Miranda-Ribeiro — Diccionario do Inst. Hist. I pg. 210 ; t-1922 — Recenseamento de 1920 — Esbôço Geral da Fauna Brasileira, pg. 38 ; Zoologia Brasílica — Pg. 131 — 1924.

"*oldest Mycetinus*" ever known ; I agree also that *Callicebus* is a very low one — but I do not agree that *Homunculus* is neither a *Mycetes* nor a *Saimiri* or *Aotus*.

Of course I have already said extensively what I mean on the matter at the chapter on the howlers. I do not agree also that *Brachyteles*, other Cebidae, could be a forerunner of the *Catarrhyne* Primates — even if being found in Cuba. Indeed, we do not know if Ameghino is willing to mean that the teeth he has also referred to *Ateles*, when describing his *Montaneia anthropomorpha* (81) from Central America, is embodying the genus *Brachyteles* we are dealing now. The mater itself of this last genus of Ameghino is not other than a destructive one for his theories on the origin of man in South-America. And the oldest granted genera of fossil monkeys here are *Protopithecus brasiliensis* Lund. and *Calicebus personatus* (Geoffr.) and few other from the pleistocen strata of Lagôa-Santa. As it is well known, the lack of sedimentation on the proper name of the zoological strata of Ameghino and other South-American palaeontologists do not let a solid ground to good buildings. Notwithstanding we can state that *Callicebus*, Mycetes (= *Cebus* Erxleben) *Hapale*, Cebus auctorum (= *Pseudocebus* Reichenb.), *Brachyteles* (= ? *Protopithecus* Lund.) of the pleistocen ; and *Homunculus*, from the miocen, are the genera which have evidence in palaeontology, that is to say, they are old genera ; but they are indeed very new ones, if compared with the North-American others... But even if we follow Bluntschli (82) who claims for the "*Notostylops* bed of the eocen" this is also a matter which has its answer when local men of science like Roth, who have also seen the original of *Homunculus*, say "If it will evidenced *Homunculus* to be a *Cebidae*, this group should have been recently separated from the lower terciary" (83).

Winge was one of the authors who have worked the South-American Primates on the ground of their anatomy ; he and all other zoologists have laid stress chiefly on the shape of teeth ; and Ameghino, dealing with his *Homunculus*, was gone into details of same to built his genealogical trees.

Bluntschli, as it is known, was of the same ground of Schlosser who stated the tetralobular shape of teeth for such animals.

Then two characters of great value spare the South-American *Cebidae* from the Old-World ones :

I — The shortness of the ear-duct (Winge)
II — The tetralobular molar teeth (Schlosser).

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(81) Ameghino, Obras completas — Edit. Torcelli — pg. 415 — 1934.
(82) Bluntschli, op. cit. pg. 43.
(83) Santiago Roth — Revista del Museo de la Plata — pg. 245 — 1927.

We may assign other elements to these, the one connected with the shape of teeth and vegetable food, the bulk of the caeca ; the other with the arboreal life and the functions of the tail : the thickness of the inter ocular isthmus ; the width of nasals, etc.

If we take time into consideration we see that the fossil samples of every genus is shown from the big bulk to the small one in the strata and in the actual times :

"I *Speothus pacivorus* 2 *S. venaticus* (*fossilis*) and 3 *venaticus*, actual", hence we are authorised to conclude that *Protopithecus* Lund and *Brachyteles* Spix can be assigned to the same genus — as it was done, allready by Winge himself, excluding only the reserve on the very scanty pieces of bone he had at hand to deal over.

If from the side of body structure it may be said an elevated genus — from the structure of the tail it is to be compared with the *Didelphiidae* and other Marsupials with prehensil tail ; and *Coendu* amidst placentals ; it is indeed much more specialised in such a ground. From the external urogenital side it is also more primitive than other *Cebidae*, and the only genus in which the connections with the cloacal structure of the Marsupials is remembered through the anatomical feature of its perineus.

If we may lay stress to the shape of urogenital organs for classification, as is the meaning of the wide spread work of Pocock, this peculiarity must take *Brachyteles* as one remembering the most primitive among Cebidae and even Primates.

Indeed Pocock owing to the material at his disposition as dealt only with some parts of the organs in Brachyteles. I also, when dealing for the first time with this matter, (84) have only given the meanings of ill — informed hunters. Pocock and myself both we have overlooked the early information of Natterer who gives the first account of this anatomical (85)

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(84) Boletim do Museu Nacional. Vol. I, pg. 211, t. n. 3 — Março de 1934.

(85) "Der schwanz ist sehr stark, breit, an der insterseite flach, und in der Mitte vertieft, an der Spitze der unteren Seite ein 9 Zool langer, haarloser Fleck, der übrige Schwanzs ist sehr dick behaart, nur eine Stelle, von After etwa 3 zool abwarts, ist sehr kurzen Haaren besetz. Die Gegend um den After und nach vorwarts und die sehr grossen Zeugungstheile fast ganzs Kahl, Schwartz grau, mit wenig Haare besetzt, blos die Haunt des Penis, die nicht Zurückgesogen wird, mit rostfarbenen Haaren besetst. Von After Abwartz bis andie Hoden geht eine doppelte fleischige Wulst, in desen Mitte ein Gewebe wie die Lungen einer Schlanger sich befindet". Natterer, in Pelzeln, Brasilische Saugethiere von August von Pelzeln K. K. Zool. Bot. Gesellsch. z. Wien, Bd. XXXVI, pg. 9 — 1883.

feature. Again the disposition of the hairs in the base of the sctructure of the same region in *Anomalurus,* if we bear in mind the connections I have shown (86) between scale and hairs.

In short, *Brachyteles* is one of the Brasilian Monkeys the less known ; one says it lives on the roks of the Organ Montains and others say it is the most arboreal of the Platyrrhine. I have never seen it in Nature ; only a young in captivity. This was a tame creature but much more quick than the wide known *Ateles* and *Lagothrix*.

IN CONCLUSION

Cebus Erxleben (1777), is the taxonimic of the howlers ; *Alouatta* Lacépède (1799) was based on the *Simia belzebut* of Brisson which is the type of *Ateles beelzebul* (Linnaeus) (1766) restricted by E. S. Hilaire and G. Cuvier in the Encycl. Meth. (1795) and Anat. Comparée Ist 1801.

Pocock spares the howlers into sub-familie rank ; evidence is against a so great severance and give stress to Winge who seems connect them with *Homunculus* Ameghino, which can be assigned to a primitive rank (Winge and Schlosser).

This is discussed since Bluntschli ; notwithstanding the matter needs to be reexamined because the skull of *Homunculus* seems to be that of *Callicebus* and the mandible that of *Ateles ;* if such be not the case *Homunculus* may be a generalized intermediate between both genera.

Whereas to the connection of *Propliopithecus* of Fayum to the case as apologized by Schlosser and rejected by Bluntschli based on *Notostylops,* the howler's outlines in some way give stress to Schlosser's thought. Of course the case may be searched as shown by the holarctic palaeontology.

Cebidae as a whole do appears a segregated, some times lowered, zoo-geographical group ; they show anatomical features recalling the Pedimana of Vic d'Azir. From evidence, Marmosets are degenerate Cebidae and *Callimico* renders untenable so high divisions as *family-ranks*.

If it was not so we would be led to include *Brachyteles* into the *Catarrhine* group, while evidence is sparing *Saimiri* as the most old-world fashioned S. A. Monkey.

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(86) Pr. Zool. Soc. 1934 — 1935.

Brachyteles Spix, 1823 can be said the same as *Protopithecus* of Lund, with reserve for new material. It has been erected as a very high form. Indeed from the external genitalia and perineal structure, it is a low genus recalling Marsupials.

A RECAPITULATION

CONSIDERING ALL AUTHORS

As a matter of fact four directions were given to the conception of the S. A. Monkeys: Authors who have them as a single family, *Cebidae;* authors who think they may be considered into two families, *Cebidae* and *Hapalidae,* others who gets them into three families: *Cebidae, Hapalidae* and *Callimiconidae* (87). At last Miller (88) who has given the Am. Monkeys into seven families: *Callithrichidae* (Marmosets), *Aotidae, Alouattidae, Saimiridae* and *Cebidae* "omitting the aliens Pitheciidae and Callicebidae" (89), as it is supposed by Pocock.

I have listed the number of genera given by Elliot in the part I of theese Commentaries. Thomas and Pocock have criticised every species and genera of Monkeys and Marmosets and made keys to the genera and groups into which they may be distributed.

I wish now to draw the attention of the reader on the main points sketched out in the preceeding parts and to bring forward the result of all authors and ours as supported by facts. Excepting Miller who gives no reasons, for the other authors the ground for the quoted grouping was stated chiefly:

1st On the number of teeth;

2nd On the nails and tegulae;

Zoology of to day do not forget palaeontology, and fossil genera have been brought into discussion: there are 20 actual genera in S. A. while

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(87) Dollman Pr. Z. S. London, vol. 107 Ser. C — N. 13 — Dec. 30 — 1937, pg. 64.

(88) Bull. U. S. Nat. Mus. n. 128, pgs. 167-171 — 1924.

(89) Proc. Zool. Soc. April 3d — 1925, pg. 40.

the admitted fossils amount to 7 genera out of discusion, which we can summarize as in following table :

GEOLOGICAL TIMES	MIOCEN	PLIOCEN	PLEISTOCEN	ACTUAL (1)
Chronological evidence of the admitted genera.	*Brachyteles* ?.....	.....	*Brachyteles*	*Brachyteles*
	Homunculus.....	.....	.....	.....
	Ateles ?.....	.....	*Ateles*.....	*Ateles*
	.....	.....	*Cebus*.....	*Cebus Erxl.* (Cuvier — 1801)
	(*Callicebus* ?)	.....	*Callicebus*.....	*Callicebus*
				Aotus
				Callithrix (= *Pithecia* auctorum)
				Chiropotes
				Cacajáo
				Neocothurs
				Lagothrix
			Pseudocebus.....	*Pseudocebus*
				Saimiri
				Callimico
				Leontocebus
				Mistax
				Seniocebus
				OEdipomidas
				Mico
			Hapalè.....	*Hapale*
				Cebuella

(1) Bearing in mind what is writen in the pags. 833-836 of this paper, in the chapter: "Further data on *Brachyteles*" *Oreonax*, Thomas, Annals & Mag. of Nat. Hist., Ser., IX, vol. XX, pg. 596.1927, is here considered a *genus inquirendum*.

This tabulation is made with corrections on the howlers (Cebus), parauaçús, *Callithrix*, cuxiús, (*Chiropotes* = *Pithecia* auctorum), pregos and caiararas (*Pseudocebus*) and the nomenclature followed Thomas and Pocock.

From such a tabulation we see that *Hapale* is the single genus with m 2/2 and tegulae, inclosed amongst the pleistocenic others corresponding S. A. Monkeys (90).

It is also giving stress to the conjecture of *Homunculus* to be a generalized form, as it was said for *Callicebus*.

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(90) Miller says *Montaneia authropomorpha* Ameghino to be an *Ateles*, probably brought from S. A. The sample had been found into an indian grave in Cuba. (Boll. 128 — U. S. Nat. Mus., pg. 170 — 1924 ; Smiths. Coll., vol. 66, n. 13, December 8, 1916).

From the known data, in the preceeding parts, we have seen that Sir Frank Collyer has shown that variation of molars in S. A. Monkeys has greater frequency in the absense such teeth; (90-A) and in pl. 4, figs. 3-5 of this paper have shown the evidences in the shape of the head of the young of *Aotus* and the true Callitriches (= *Pithecia* auctorum), in intra-uterine growth :

> Both acuminate, conical which are in opposition to the already known too short, rounded others (Bronn's Classen etc. pl. IV and the author, P.Z.S. January 1935, pg. 772, pl. V, figs. 2, 2a and 3).

Pocock called *Aotus* orthognathous ; and I have shown it a very prognathous one in the milk-teeth stage.

Also a lemur — shaped outline was shown in the foetus of *Callithrix albicans* (= *Pithecia albicans* Gray).

Whereas to the howler one finds exactly the reverse, that is to say, the foetuses came as if from an orthognathous brachycephalic outline (pls. V fig. 2, 2a & 3, P.Z.S. 1935) to the utmost prognathous skull of the full grown. Brain case and face offer a complete rotation from the short, spheroidal head in which the lower jaw is under the brain case, to the same — planed skull of the full grown male, where the brain case is behind the rostral part and on the same level of the palatal bones, or incisive teeth.

Then the head of the old howlers offers a paralelled shape with that of *Lybipithecus* exhibited by Abel in Weber "Saugethiere" ; while mandibles of acuminate symphysis recalls that of *Parapithecus* (See such work, pg. 833, fig. 572 and 824, fig. 562). From the other side I have remembered *Saimiri* with the head recalling, chiefly, from the rostral part, something like the Gibbons.

The words of Sir Arthur Keith (91) remembering the similarity of both forms can not be said old thing ; but one of the oldest and genial anatomists of the last century. De Blainville, had already struck on that similarity of shape in a quite opposed way :

> "What is peculiar to the Saimiri is that its interorbital septum is not fully develloped by the lack of the *os planum* of the human anatomy or from the small development of the side wing of the ethmoid, and because the head all over is as if *buloidal* from the high thinness of the bones with quite smooth surface.

(90-A) Sir Frank Collyer — Variation and diseases of the teeth in Animals — London — 1936, pg. 61.

(91) Sir Arthur Keith — Man's Family Tree — Pg. 47 — 1934 fide Serge Freschkop Le pied de l'Homme — Pg. 319 — 1936.

Both these peculiarities, and chiefly the first one, make, the bottom of the orbital hole of the Saimiri something like that found in birds through the great contiguity of the orbital-holes (what wishes to say Daubenton when he describes the nasal openings of the Saimiri, as bring between the orbital holes, so, he joins, as in Gibbons and Talapoins? This I can not understand, nasal holes outline is in trefoil or better four rounded lobes; but it do'nt goes, higher than in the Sapajous". (92)

But Blainville himself finds S. A. Monkeys recalling Man through its high frontal and facial angle (op. cit. pg. 2-3).

So, struggling into the difficulty of understanding how to consider the true kinship of S. A. Primates, in part. Ist of this paper, I have shown *Callimico* a generalised one; in part IV. I have dealed with *Homunculus* which I suppose to be same nature; and exhibited fresh, exact photo of the nares of the howler and that of the muriky, the last one, Pocock based on dried skin was gone to write: "both in direction and narrowness of separation more like those of a typical *Catharrhini* species than they are like the nostrils of *Chiropotes* and *Cacajáo* in which the platyrrhinism reaches its highest expression" (93).

In part III — I have shown the Yarkeas the ut-most platyrrhines; in part II *Aotus* with the lactant dolichocephalous and prognathous head; and part IV, pg. 13 the howlers foetuses to be coming from brachycephalism and brachygnathism. See also this part., Pl. 16, and Pr. Z. S. London — 1935, pl. V, figs. 2, 3 and 2a — 1936.

Now we have to deal with two new masters on the matter. Such are Anthony and Coupin whose preliminary results on the taxonomy of Primates was given in 1931 (94).

We do reproduce, from theirs *Simioidea,*

"Sous-ordre", which they get as divided into *Platyrrhini* and *Catarrhini,* the first one of which is tabulated as:

1 *Hapalidae*	= *Hapale, Midas, Leontocebus.*
2 *Cebidae* 2' *Callimiconinae* . .	*Callimico* (Genus)
3' *Nyctipitheciinae* . .	*Nyctipithecus, Callithrix* + (*Homunculus, Anthropops, Eudiastatus, Pitheculus and Homocentrus*) actus! and + (fossil)

(92) De Blainville — Osteol. Primates — Pg. 18 — 1839.

(93) Pocock — P. Z. S. April, 1925 — Pg. 37 — Foot-note.

(94) Anthony, R. &Coupin, F. — "Tableau Resumé d'une Classification Génerique des Primates Fossiles et Actuels" — Bull. du Mus. de Hist. Nat. de Paris, vol. 3eme, n. 7 — 1931 — Pg. 566.

4'	*Pitheciinae*	*Brachyurus, Pithecia* et *Chiropotes*.
5'	*Mycetinae*	*Mycetes*.
6'	*Chrysothricinae* . .	*Chrysothrix*.
7'	*Cebinae*	*Cebus, Capucinus*.
8'	*Atelinae*	*Ateles, Brachyteles, Lagothrix*.

We may reproduce some words of the author:

"This generical classification of fossil and actual Primates is the result of many years of anatomical inquires and long reasoning on the relative value of characters. It is distined to the introduction of a treatise on Physical Anthropology, a not yet finished work of many cooperators" (95).

We can not let to recogn here the same ground schema of Thomas and Pocock as already cited and discussed the preceeding parts.

FURTHER DATA ON *BRACHYTELES*

One lactant muriquy (*Brachyteles*) of the old collections of the Museum shows the following charaters, out of that which is known from the adult one: Head rounded, bulky; snout slightly projecting and covered by a coat of short and fine hairs of two sizes, round about the lips, chin and nares. Face naked as round the eyes. Ears great, free, directed to the sides; and covered with long scattered hairs. Measures:

Heard	9 cms.
Arm	21,5
Leg	26
Body	18
Tail	34

Then the chief external character is shown by the patch of hairs round the lips, and size and position of ears. This patch is somewhat blackish while the face is flesh coloured, what brings reference to the blackish spot of pigment round the mouth we do know in the *Saimiri*. The nares are alike that of the adult but their borders raised and as if covered by velvety fine and short hairs.

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(95) "Cette classification génerique des Primates fossiles et actuels, résulte de plusieurs années de rechèrches anatomiques et des longues reflexions quant à la valeur relative des caractères. Elle est destinée à figurer, plus detaillée, en tète d'un traite d'Anthropologie Physique auquel travaillent plusieurs collaborateurs, mais qui n'est point encore achevé". (Anthony & Coupin, op. cit. loc. cit.)

The skull is the most interesting amongst all other S. A. Monkeys. The shape is dolichocephalic, orthognathous and its surface smooth.

The brain case is swollen and the frontal bone has not any ridge over the orbital holes, being quite vertical there. Orbital holes about so approached as in *Saimiri,* the lacrymals in the inner side of the orbital rim and the rostral part very short and slightly oblique, suborbital foramina multiple, subequal and linearly disposed; malar one moderate. Zygomae feeble, low, very low on the tooth row which is widely bowed and encircling a wide palate; this shows the maxillary very vertically directed upwards, as to attain the orbits and malar, its rim to the intermaxillar is vertical and theese bones are feeble, small, few developped upward, not entering high the sides of the nasal hole. The nasal bones are very peculiar; not by their upper corner which is alike that of the adult, but by the under border which is cutted of angularly at the inner side; this makes an M shaped rim when the two bones are figured together; and two considerable nasal holes are situated at each side out of the external legs of the M. This curious feature of the nasals of the lactant muriquy (less the holes) is only found in that of the face drawings of the *Homunculus,* as seen in the figures of Ameghino and Wood-wards' Zittel. Orbital hole well under seated at a very narrow distance from each other, directed forward and about alike that of *Saimiri,* but the isthmus is stouter. Lachrymal within the orbital rim and behind the nasal process of the maxillary. Milk teeth offers a very small and near set teeth-row, verti-cally disposed into the alveolar sockets of the intermaxillary. Examined under magnifying lenses they show some irregular but slight depression over the fore face of their chisel-shaped crown. Such depressions make a trico-nodont figure on the face of the crown. Canines are already pointing out; if compared with the incisives they are wide but show a somewhat premolar shape, with a slight fold on each side of the mesial point. Premolars are fairly triconodont if seen from side; but they have a low but wide longi-tudinal excavation which hold high the internasal border. Molars are com-plicated into the compound shape of two-premolars each; only the lateral rims are very in way to recall the lophodont's shape teeth. The tooth row of upper maxillary considered in its regular arch is the most human I know into the S. A. Monkeys' list.

It recalls to my mind either Gibraltar or the Rhodesia upper tooth row outlines as sketched out by Sir Arthur Keith (96). Intermaxillary palate is short, its plan is very near of the under braincase one, wide through a wide

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(96) The Antiquity of Man, I, pg. 214, fig. 78 — And II, pg. 445, fig. 445 — 1923.

under margin and bowed short palatal. Uvular process evident. Choanae moderate very low in consequence of the vicinity of the rostral and brain case's under plans. Vomer projecting well between the lateral turbinals and well channel-shaped for the support of cartilaginous blade. The brain case is quite ovoidal, stout and somewhat *Saimiri* — shaped both in outline (less in the position of the condyles) as in smoothness. But the frontal is higher, its upper and fore lines in right-angles, the orbital bows quite without torus. Its posterior border almost linear is also almost in right-angle and the bregma stands well in the moddle of the braincase. There is again a metopic sisure quite perceptible; and behind the bregma we see two bregmatic angular bones, as if fullfilling a fontanelle; its orbital border tapering into a wedge (formed by small bones) meetting down with the alisphenoid, performing a k-shaped pterion. Parietals wide, spoon-shaped but faintly divided by a slight fissure which comes from the level of the supra orbital rim to occipital bone; its under border is pratically stright and comes to reach the posterior upper border of the mastoid. The auditory bones are well develloped and the conical bullae decurved from a short neck where are clearly seen the ossicula whose position is better seen from the magnified photo here appended. (Pl. 18, fig. 2) The Eustachian tubes are wide.

Pterygoids, partially broken, let see the internal rim faintly shown. All the sphenoidal wide, solid and letting see the oval hole wide and well before the Eustachian channel. Carotidian channel behind the neck of the bullae.

From the occipital, infortunately only the basilar process was preserved, therefore nothing more is show from its shape than its concho-balooned outline.

Then, from all that is known we have the following strange data:

I Nasals M — shaped in their antero-inferior border. II Parietalia with an upper faint suture corresponding to the upper temporal line; III — Only two premolars aside the three molars when we do know that "the three premolars are remnants of an ancestral heritage of three premolars and the number distinguish the Platyrrhine from the Catarrhini" (97). This is also seen in a young of howler; or may we consider the milk canine a premolar? This lactant monkey is of about the same stage of development of the "skull of a child, dissected to show the roots of the milk teeth and figured in the pg. 668 of Keith — 1925; (98) and I have cautiously sought for the true classification of its teeth.

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(97) Gregory — Origin and Evolution of the Human dentition — N. Y. 1922 — After Sontag — Pg. 41.

(98) The Antiquity of Man., vol. II,

Behind the incisive row, in the fore part of the intermaxillary, there are four couples of pits, one of them with the vestigiary point of one teeth, I am afraid to call it other thing than a pre-lacteal one.

The lower jaw has a feebly opened u-shaped body with the ascending branches with the nearest inclination to the out side as that of the Chimpanzé see in the fig. 236 pg. 645 of the IInd vol. of the "Antiquity of Man" of Dr. Keith. The chief difference is shown in the lesser distance from the mesial vertical shown by the angular corner. The body itself is stout, tumefied, swollen at the symphysis, quite smooth and rounded here but with a somewhat raised mesial line. Ligastric *fossulae* moderate but mesial rim of the lower border slightly prominent, as if making a backward directed mesial process. So, the lateral outline is bowed as if letting a slight ridge near the alveolar border. Alveolar and lower borders pratically parallel; coronal process, notwithstanding to be broken, letting see it is not higher than the condylar one. Oblique line stright. Lower border almost stright, feebly S-shaped. Mentonian holes two in the left side, three in the right one; seen from before the chin has an outline recalling the *Anthropops perfectus* (pg. 576, pl. CLXXV, fig. 327 — O) and *Homunculus patagonicus*, pg. 574 — pl. CLXXIII — of Ameghino (99). Alveolar border pratically stright from the m_1; m_2 again into the alveolar socket and very near the tooth channel. Five pits each side of the symphysis, behind the alveolar sockets (100). Sublingual fossulae vertically over the digastric one in such way that the symphysial inner surface of the body is inclined backwards to its upper borders falling down therefrom vertically to the lower border of the digastric one. Mylohyoidian line comes just to meet or produce the severance of the upper and lower fossulae. Spix's spine do not exist. Sigmoid angle is wide and low and the condyles show a very faint surface to the pterygoidian fossulae.

The hinder border of the ascending branch is in right angle with the lower one of the body; and the angle, wich is rounded of, has the masseterian tuberosity slightly raised outwards from the blade's inwards direction. In this peculiarity this mandible is quite different from that of the howlers in the same age, where the angulare rim is directed to the inner side of the bow of the mandible. Seen from beneath the bone all over has the external opened — u-shaped outline, encircling a V-shaped internal parallel one, in which the apex is truncated.

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(99) Formationes sedimentares de Patagonia — 1934.

(100) Future alveolar sockets for the permanent teeth. Last remnants of aborted prelacteal teeth?

THE LOWER JAW

Lower jaw has been a guide to the construction of series in Primates; and physical anthropologist feel not troubled by the lack of other data to considere enough as, for instance the Heidelberg jaw, as a data strong enough to make its undiscovered bearer a connecting link.

I have tried to show the lesser variations of the lower jaw amidst S. A. Monkeys in a very hasty way; as we have seen (Part. IV) the chapter is a very interesting one, notwithstanding the usual consensus that the symphysis of the lower jaw was onley always rounded and sloping backwards.

Variation do lets see also in the sexes, showing a true dimorphism each one for male and female; therefore we see the *Ateles* male with a prominent, high, backwards rounded jaw as in pl. 3 of the Mammiferos (101) of the Repts. of the "Commissão Rondon"; what is not the case in the female, as in the pl. 2 of the same paper, and was also shown here in the pl. 15 of this paper.

Winge has allready said the mandible of *Homunculus* a *more primitive* one; I have shown such a bone corresponding to that of the female of *Ateles paniscus* (See pl. 15 of this paper).

There is an other variation and that is found in the jaw of *Lagothrix*. This wolly monkey's genus is placed together with the howlers by some authors and near *Pseudocebus* (the Capucins and Caiararas) by Winge. This last seems to me the proper way; and the jaw shows exactly an intermediate form between *Brachyteles* from one side and *Pseudocebus* from the other.

The angulare is not just so highly bowed as in the howlers, *Ateles* and Muriquys, but the alveolar and lower rims of the ramia are parallel; and the symphysis is rounded at the lower border, but quite flat and subvertical in the upper anterior half.

When we look at the beautifull plate of the bony head of *Brachyteles* (Pl. III, vol. II) published by Elliot, we would never suppose the shape exhibited by the same bone in the young stage, as it was up described and can be seen in the photo I join here (Pl. 16).

The outlines of the bones are very imposing and we remain perplex when considering its evidence; one would be led to see in its raising before the teeth row's vertical, as something more than the Heidelberg bone's miniature.

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(101) Miranda-Ribeiro — Comm. de Linhas Telegraphicas Estrategicas de Matto Grosso ao Amazonas — Annexo 5 (Publ. 17) — 1914.

In this peculiarity the mentum of the young of *Saimiri* is also worthy to be considered as it recalls the words of Sir Keith ; but here, we have a mentonian protuberance severed from the teeth root's symphysial swelling by a transverse, moderate but evident depression. If we had to speak like venerable Parker (W.K.), we would be led as considering this jaw as "bearing a *larval relation* to the highly modified" jaw of Man.

I have allready spoken of the asiatic feature of *Saimiri ;* and it deserves surely many inquires from the morphologists.

NASAL — BONES

Let us see once more which are the variations of that bones. In the young *Brachyteles* they were described above and we have seen theirs relatives in the *Homunculus* nasals shown by the drawing of the authors.

In *Aotus* they are simple, small, their upper angle is in the middle of the occular septum. which the upper part is formed by the frontal bone; their lower end is simple, obliquely cutted of to the sides from the internasal suture — and followed by a long cartilaginous process which recalls the bony nasal terminal structure of the nose of the Lorisinae.

"In Pithecia, says Pocock, the nasals are broad and noticeable bulging above the nares" (102). (We do know I get the name Callithrix 1911 — Humboldt, for the so called Pithecia of Lesson 1840). It is a pity that Pocock had not went forward on this peculiarity of this genus ; indeed it is a very interesting one and finds explanation only as the remains of the bony nose projections we do know in the snout of the Lorisine. Such projection is the samething we do know as cartilaginous nose process of the nares of *Aotus*. Only here, notwithstanding to be ossified it is reduced to the upper rim of the fossa nasalis. As the muzle of the animal is shortened with the growth, the shape of the snout becomes stump and bulky notwithstanding the prognathism of the rostrum. I have spoken about the nasals of the howlers (*Cebus*). I have one skll of young from Piauí — with the tooth moult already finishing. The lateral borders of the bones are almost parallel, somewhat decurved outwards there is a foramen near the outer borders in the lower fourth of each bone and the marginal under border lets see an opened M-shaped figure. Upper (frontal) end is crenulated and its outer margin enters the rim of the orbit and lachrymal póre. In such way it recalls the marsupial homologue.

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(102) P. Z. S. April 3d. — 1925.

LOWER CONNECTIONS

Sontag has allready summarized the lower connections of the S. A. Monkeys, that is to say-with the Lemuroidea :

1

"Although they are more or less specialized, they all retain traces of their common ancestors". (pg. 35).

2

"All Platyrrhyni are arboreal, and their progress among the trees may be assisted by a prehensil tail". (pg. 35).

3

"Although the Hapalidae and Cebidae are all included in the Platyrrhine Section, the nasal septum is not allways broad. H. O. Forbes has shown that the septum is comparatively narrow in *Aotus, Alouatta* and *Brachyteles* and the nostrils are directed more forward than in all other genera which have the typical broad septum and outwardly directed nostrils. The nostrils are circular, slit-like or S-shaped. The septum and nostrils in the primitive *Aotus* are like those of the Lemuroidea, and different from those of all other Primates. (pg. 36).

4

Hairs "They are implanted in groups of three, four and five". (pg. 39).

5

"The peri-anal skin has marked *odoriferous gland* in the marmosets" (pg. 39).

6

"The tympanic annulus is transversely short and it is widely open laterally. It overlaps the tympanic bullae, in the possession of which the Platyrrhini agree with the Lemuroidea and Tarsioidea". (pg. 40).

7

"Gregory (The Origin and Evolution of Human dentition" N. Y. 1922) points out that the three premolar teeth are remnants of an ances-

tral heritage of three teeth, and the number distinguish the Platyrrhini from the Catarrhini. (pg. 41).

8

"In the *Hapalidae* a separate interparietal sulcus may not exist" (pg. 45) as in the Lemuroidea.

HIGHER CONNECTIONS

These have been found since Blainville who finds "the howlers, notwithstanding the hyoid bone and facial angle with a dental system recalling better the Gibbons" (103). Indeed, if he had kown *Lybipithecus,* he would be led to see in it a more close connection with this Primate, to which he would also believe as possessing a similar bulky hyoid apparatus.

Whereas to the skull the grand French-Zoologist finds that "the connecting spot of the frontal vertebra with the nasal one, is much more imposing and recalls more what suceeds with Man; and as the maxillaries are at the same time shorter, more declined at the nasal root, and the brain case is more tumefied in its whole shape, chiefly in the frontal bone, it results therefrom a facial angle remarkably greater" (104).

Theese words are very much inspired in the highest connections we can find amidst anatomical characters of the Primates all over. Notwithstanding we ought to reproduce the connections he found in the skeleton of *Lagothrix* (young one), the apophysian coracoid under the well marked shape of epiphyse, peculiarity which is found also in the young of Chimpanzé (105).

Fowler quotes "certain *Mycetes* and *Ateles* with the parietal and alisphenoid bones in contact on the side wall of the skull — a Catarrhine character" (106). "The humerus has no supracondylar perforation any of the Old-World *Simiina* nor in *Ateles, Mycetes* or *Hapale*" (107).

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(103) Osteographie — I — Pg. 18.

(104) Osteographie — I — pgs. 2-3: "Les vertèbres céphaliques du Sapajou que nous prenons pour type sont un peu autrement disposées que dans la Guenon qui nous a égalment servi comme tel, en ce que la courbure, au point de jonction de la vertèbre frontale avec. la vertèbre nasale, est beaucoup plus marquée et rapelle davantage ce qui a lieu dan l'espèce humaine; et comme les appendices maxillaires sont en même temps plus courts, plus tombants à la racine du nez, et que le crâne est plus bombé en totalité, et surtout au front, il en resulte que l'anglo facial est notablement plus grand". (1839.)

(105) Idem — Op. cit. pg. 17.

(106) Intr. Osteol. Mammalia, pg. 163 — 1885.

(107) Idem, pgs. 272-273.

We have seen Sontag quoting Forbes on the nasal septum of Alouatta and Brachyteles (pg. 36) ; citing Pocock on the hands and feet of *Ateles* approaching thoose of *Simia* (pg. 38). He says the hairs implanted in groups of *three,* four or five" (108), as in Man. He quotes the absence of callosities (pg. 39), the sacculation in the stomac of *Ateles* and *Alouatta,* as in the Old World Semnopitheci, what was found by Vrolic (pg. 43) ; the liver intermediate between those of the Lemuroidea on the one hand, and the Catarrhini on the other" (pg. 43) ; the aortic arches as in Man (pg. 44) ; the kidney of Ateles agreeing with Man and the Chimpanzee in retaining the primitive condition of several papillae (pg. 44) ; *Ateles* and *Lagothrix* not provided of os penis (109), etc.

WALKING

In a general sense walking is on fours in the whole amount of Platyrrhine Monkeys ; notwithstanding there are peculiarities to be observed amidst the many forms they embody.

Walking on fours is chiefly peculiar of the Chiropotes which the early representation is pictured by Thevet (110) and reproduced in the pg. 942 of the last number of the Boletim do Museu Paulista (1937 — vol. XXI) by my friend Dr. A. de Taunay. Such a figure is a very well observed one of *Chiropotes* and its Lemurine way of bearing the tail is there well exhibited.

We have seen as Winge has intensively remarked the constitution of the arms in the "Mycetine" with chief reference to Brachyteles and Ateles, what has been also referred from other authors. I return to this point to connect it with the so called "brachiation" we do know in the Apes. Whereas to my own observation the "brachiation" as it is understood in the Gibbons and Orang do not exist in the S. A. Monkeys. If we look at the Caiarara (*Pseudocebus*) or even the *Ateles* or Spider-Monkeys, they never leaps hanging from beneath each branch to an other only aided by the arms ; they run and leaps *on the branches* on four, at full speed and leaps in the same way from one to other but never employng only the hands and getting the legs pendulous, has it is known for the Gibbons and Orang. As counterpart "orthogradism" is almost a favorite way of walking to the *Ateles ;* they go on the ground not bowed on the pelvis, as the Gibbons, but freely erect and bearing the tail high raised, parallel to the body or with the end searching

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(108) Italics mine.

(109) Sontag — Morphology and Evolution of the Apes and Man — London — 1924.

(110) Thevet — Singularités de la France Equinoxiale.

forward, the arms up set, and the hands decurved hig over the head. I have seen theese animals going in such way even on the branches of the trees. They are bad runners, even on fours, and it is easy to follow their floks by going under the trees while they fly away.

I have seen elsewhere a picture of theese monkeys passing small streams by common aid, condensing their bodies through hands and tail into living strings which is balanced from a three of a bank to an other of the opposed side; I have never seen this fact — but my friend Mr. Antenor L. de Carvalho has told me he had seen the flock of *Ateles* in the Zoo of the Pará Museum, trying to perform this way of crossing small spaces from tree to tree, but this was while playing and over solid ground.

The extension of the cerebrum overlapping the cerebellum is remarked by authors in *Saimiri;* this overlapping of the neopalium is even given as a connection with the orthogradism; but in *Saimiri* the orthogradism never takes place because its favorite walking way is on fours, and so it runs and leaps, sometimes in the same flocks of the Caiararas, and in the same way. This shows also that the chief morphological character of development of the brain connected to the superiority of Man over the Apes, out the well known development of the temporal lobes, is the overlapping of the fore-brain's lobe on the orbital holes, in such way that the frontal lobes are shown imposing the frontal bone vertically high and bulky, and owed, consequentely, to the development of such lobes.

CONCLUSIVE EVIDENCES

1

"In all the American Monkeys", the cavity of the tympanum is close to the external wall of the cranium, (De Blainville, Winge, Fowler, etc.). "This character alone will readily serve to determine to which of the two great divisions of Monkeys a school may belong". (Fowler). (111)

"The brain of Pithecia (our *Callithrix*) is much more bulky than that of a Loris of the same weight of body". (Elliot Smith). (112)

These general characters plus the premolars $\frac{3}{3}$ show the Platyrrhini a decurrent branch starting something higher in a stem comming from the Lemuroids. Platyrrhinism again is a further developped Lemuroid character.

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(111) Osteol. of the Mammalia, pg. 163.

(112) Pr. Zool. Soc., 1919; Sontag — Morphol. and Evol. of the Apes and Man — Pg. 45 — 1924.

"The Anthropoid Apes show a comparatively high degree of numerical variation. The molars are more variable than the other teeth, in Gorilla and Anthropopithecus they are more common in the maxilla than in the mandible, in *Simia* in the mandible. The Gibbon shows a tendency to the suppression of third molar". (Sir Frank Collyer). (113)

"Variation in S. A. Monkeys prove to be stronger in the absence of molars'. (Sir Frank Collyer, opo cit. pg. 61).

Last molar is progressively decreasing in bulk from the Howlers and *Brachyteles* to Callimico. This fact must be referred to the lack of function of the tooth through the hasty eating and change of diet.

The nails in the Platyrrhini Monkeys have been evolued into the tegulae of *Callimico* and of *Hapale*. This is an almost general consensus. It is also connected with hasty eating and running through the branches.

There are two known type-shapes of early heads in the foetuses of the S. A. Monkeys — one conical, tappering; the other ovoblong, rounded. The general characters connect both them makes one forceebly decurrent from the other, or at least from same stock. This comment results from the evidence that milk premolars are $\frac{-}{2}$ in *Brachyteles, Cebus* (the howlers), *Ateles* and even in *Aotus* (See pls. 4 and 5) and that the whole Platyrrhine group is degenerated from a stock which had allready acquired the $\frac{2}{2}$ premolar formula, stock which was nearer the Gibbon's one than the Cercopitheci. This postulate makes the Colobi and Cercopitheci be placed in the opposite side as degenerating from the Simioid tipe as did Abel (114). This makes us indifferent to *Aphanolemur* as the proposed Platyrrhine stem of Gregory and be inclined to the possibility of miocene holarctic hilobatoid Monkeys, with the pm. $\frac{-}{2}$ pattern. As it is known, since Blainville, Platyrrhine are not found out the American Continent, from Central America southward. This may led us to presuppose arboreal life and exclusive vegetable diet be the responsible for the return to and growth of the Lemuroid feature

(113) Variation, etc, pg. 26 and 61.

(114) In Weber-Saugethieres, 2te. Aufl., II, in fine.

they show ; and await for representative members of the Siwalik — Fauna in the geological future events of the N. American Palaeozoology.

This is so much imposing corollary that Sir Frank Collyer found the formula $pm\frac{4}{3}$ or $\frac{3}{4}m\frac{3}{3}$ in some cases of dental formula in *Ateles margi-natus,* notwithstanding its high calvaria (115).

So, numerical conclusion is forcibly : initial $pm\frac{2}{3}$, permanent and actual $pm\frac{4}{3}$ tendency — $pm\frac{4}{4}$ (the possible future formula).

As the mandible of the S. A. Monkeys points back in the direction of *Lichainotus,* conclusion may be that the reversion to the old type is going even to the dental formula of the Adapine whose premolars were $\frac{4}{4}$.

As the opposite side we see molar decreasing in bulk and going back in function in the most rapid walking genera, with a diet more grounded over insects and birds eggs.

DIVISIONS OF PLATYRRHINE

Actual authors are being compelled to divide the Plathyrrhini into many sub-families or even families. As a mean, the most conservative of them took the formula

1 *Cebidae*
2 *Hapalidae*

And at least the newest authorities (Pocock, Cabrera from one hand, Anthony and Coupin from the other) are balancing between the constitution of the hands or the number of teeth as being principal.

The ground of Pocock and Cabrera :

"Hapalidae : $m\frac{3}{3}$ frontal bowed or $m\frac{2}{2}$ frontal depressed" is quite

(115) Sir Collyer, op cit. pg. 58, fig. 74 ; pg. 61.

insubsistent for a family group. It is even destructive to the conceptions of both those great zoologist.

We do not know the reason of Anthony and Coupin. Notwithstanding we feel them more consentaneous as getting a gradative way. But the first argument employed against Pocock and Cabrera is also true against Anthony and Coupin.

The result is that we have to await for development and embryological better knowledge to do any trink solid — as it was said by Bluntschli regarding fossil's evidence.

And this is forcible because we are dealing with a very compact and well defined group of Primates showing a so great diversity of shapes enough to led authors of cold reasonement to severe them up into *eight sub-families*. South-American Monkeys develops from foetuses to full grown: 1st — with shortening of the skull which notwithstanding lets brain case behind the rostral segment, with a low calvaria behind the orbits (*Callitrichidae, Aotus*); 2nd — with lenghtening of the skull and rotation of the brain-case from an ovoblong short head, with the frontal region high placed like the human foetuses, to a Lemuroid (or better Lybipithecoid) skull (howlers). 3rd — Others grow parallel to the outline of the human foetuses op to the two premolars irruption, the brain case rotating moderately from such a position with growth and the frontal being higher approaching the Gibbon lateral outline henceforward (*Brachyteles*).

Hence the higher calvaria to some Platyrrhine than the pattern of the Cercopitheciidae.

This leds us to consider them: Monkeys with short ear-duct; premolar milkteeth $\frac{2}{2}$, permanent premolar $\frac{3}{3}$ with tendency $\pm \frac{4}{4}$ through the frequency of extra teeth; molars $\frac{3}{3}$ to $\frac{2}{2}$. Nails or tegulae. Placental bodies generally two, haemochorial.

I

Lover, truely lemuroid monkeys, with the foetuses lemuroid in shape and full grown with the mandible somewhat approaching the paralleled borders or flatsymphysed mandibles cleft of the hand between 2nd and 3rd digits. Fox-tailed. Nails. (Cuxius, Parauaçús, Yarkea, Uakarys): *Callithrichinae*.

II

Lower, lichainotoid-mandibled monkeys, with lactant young provided of conical long — nosed skull; full grown improving into a shortened head. Hands normal, provided with cushioned pulps in the digits. Tail pendulous. Nails. (Owl — faced — Monkeys; Titis — Monkeys) : *Callicebinae*.

III

Higher humanoid skulls to the growth of the 2nd premolar, degenerating henceforward to the full grown lowered brain case with orbits before the calvaria. Mandible more than lichainotoid. Cleft of the hands as in the Cuxius and congenerics. Tail prehensil (Howlers) : *Cebinae*.

IV

Higher humanoid skull to the growth of the 2nd premolar, preserving better to bowed higher frontal than in any other groups to the adult — Mandibular rounded in the symphysis sloping downward, with the angulary region rounded and moderately expanded backwards in the male; females with the alveolar and marginal mandibulary borders parallel. Cleft of the hand normal; sometimes pollex aborted; arms more or lesse longer than legs. Tail prehensil. Nails. Orthograd-walking. (*Ateles, Brachyteles*): *Atelinae*.

V

Higher humanoid skull to the growth of 2nd premolar; mandible coloboid but with the symphysis wide, flattened more so in the males. Cleft of the hands normal. Nails. Tail pendulous : Saimiri. Tail convolvent : Capucins. Tail prehensil : Woolly — Monkeys : *Pseudocebinae*.

VI

Skull calliceboid, (Foetuses unknown) Frontal bowed, mandible tarsioid with modified teeth $m\frac{3}{3}$. Tail convolvent. Tegulae : *Callimiconinae*.

VII

Brain case calliceboid — tarsioid, mandible of *Pseudocebus*; $m\frac{2}{2}$.

Tail pendulous. Tegulae : *Leontocebinae*.

VIII

Brain case calliceboid — tarsioid, mandible tarsioid, m $\frac{2}{2}$. Tail pendulous. Tegulae : *Hapalidae*.

As it is clearly shown, the variability of characters in the whole Platyrrhine is so great, that a so high number of divisions is justified, when considered in the searched importance of the gap amidst them ; it is enough to look at the Pseudocebinae association. But this seems to me to have evidenced that the general consensus in the divisions into Hapalidae and Cebidae — can be a pratical one indeed, but never what is aimed as a right interpretation worthy to be received as the exhibition of Nature.

In this way, as a pratical key, divisions proposed by Dollman would be the most consentaneous ; notwithstanding we have seen the highly intermingled characters of the groups amidst them ; and searching the proper exhibition of the just exposed characters we would be led to see, in a philogenetical way, the Platyrrhine showing, themselves as

having foetuse's head lemurine :

Pleistocenic . . . . . *Callicebinae* (Owl-faced-Monkeys, Titis)
No fossils . . . . . *Callithrichinae* (Cuxiús, Yarkea, Uacarys)

having foetuse's head simioid :

Pleistocenic . . . . . *Cebinae* (Howlers)
Do . . . . . *Atelinae* (Spider — Monkeys)
Do . . . . . *Pseudocebinae* (Saimiri, Caiaras and Wolly-Monkeys)

having foetuse's head probably calliceboid ; mandible hapaloid :

No fossils . . . . . *Callimiconinae*

mandible pseudoceboid :

No fossils . . . . . *Leontocebinae*

mandible quite tarsioid :

Pleistocenic . . . . . *Hapalinae*

This tabulation show us five natural groups which I feel not myself authorized to call Families, because the connecting characters are easy to be detected amidst them all over, e. g. :

Cleft of the hands between 2nd and 3rd digits . . . . { *Callithrichinae* / *Cebinae*

Approaching shapes, 1-jaws, distribution and position of teeth, position of brain case and lambdoid crest . . . . . { *Callithrichinae* / *Pseudocebus* / *Leontocebus*

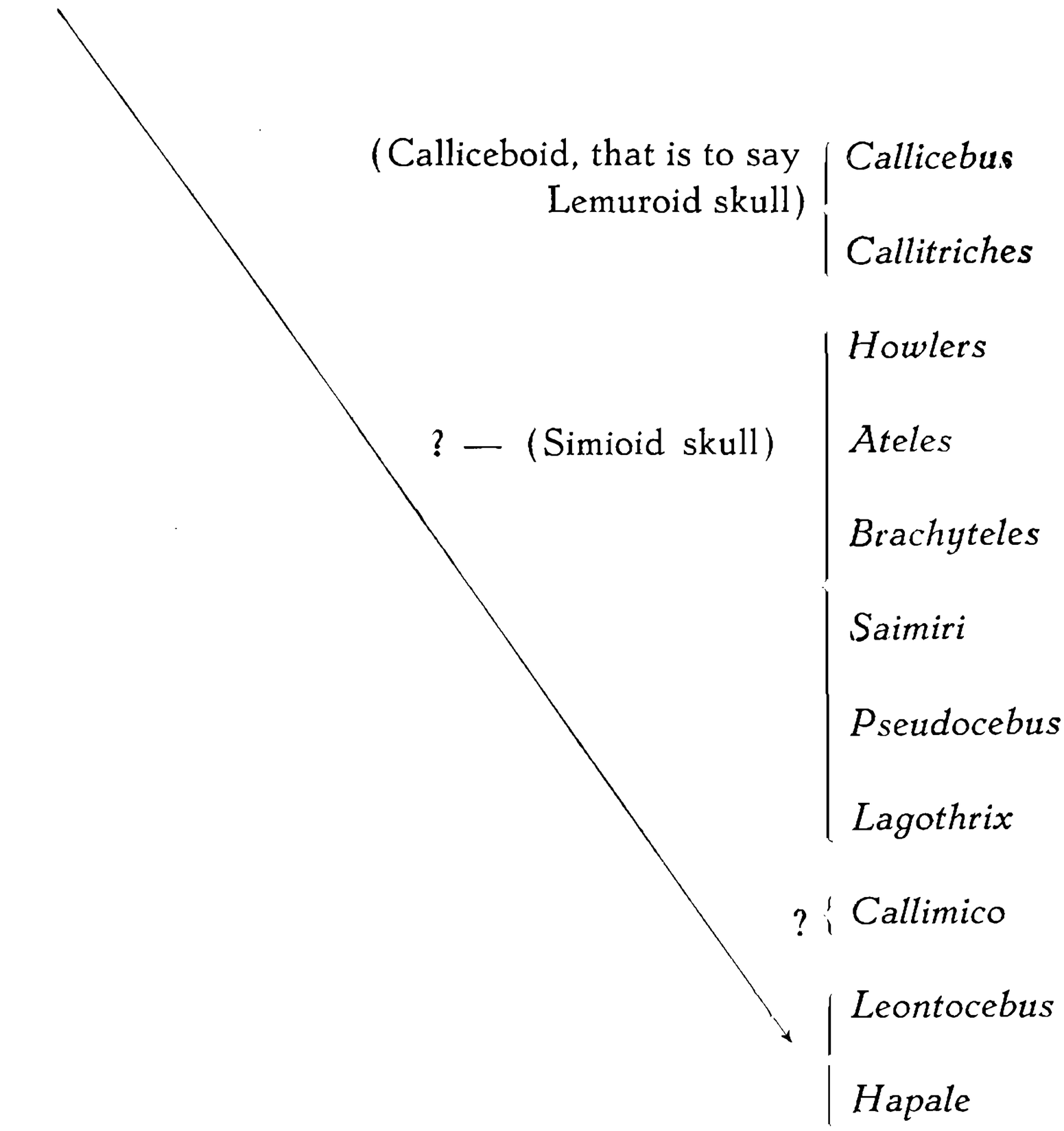
Distribution of upper teeth, shape of palatal regions { *Callithrichinae* / *Hapalinae*

In short, there are about eight values, and we can see how many combinations we may do with such numbers, which are of high importance :

I believe to have fully demonstrated, there has been a way, going into Callicebinae and Callithrichinae which was lost as going onward up to the shapes which have foetuses with simioid short head ; (Howlers, Ateles, Brachyteles) this gap is not fullfilled, notwithstanding the connection Cuxiús — Howlers Callimiconinae comes clearly from the Callicebinae ; the skull is a Callicebus one ; but the jaw is a hapaloid one.

The jaw of the *Callicebinae* itself is fully reappeared in the Howlers. in *the males* of *Ateles* and *Brachyteles*. Instead of that we have the — jaw of Gibbons in Saimiri, Caiararas and Wolly - Monkeys.

As a result we can have the graphic :



SOME WORDS ABOUT ATELES BRAIN

In 1914 I gave the bulk of the brain of an old male *Ateles* from the Parecis at the head waters of the Gy-Paraná ; it was 132^{c3}. The skull is figured in the Pl. III, of the Mammals of the Repts. of the "Commissão Rondon" (116) in a pratically nat. size photo, which can be taken in controll. The occipito-nasal line is 90 millimeters long, and an sketch of its mesial outline is given Pl. II. Over this outline I have superimposed the outline of the hoolock, as published by Sontag (117). As it is known the hoolock has

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(116) Miranda-Ribeiro — Mammiferos — Publ. n. 7 da Commissão de Linhas Telegraficas Estrategicas de Matto Grosso ao Amazonas.

(117) Op. cit. pg. 286, fig. 50.

the occipito nasal lenght 93.9 : breadth (of braincase is 61,5 in the hoolock and 58 millimeters in the quoted *Ateles*) From what we can see in the Pl. II we do not need to say many words on the coincidence. Sure, the brain figured by Sontag is not of a big monkey; (118) but it is just fit to show the parallel borders of both outlines ; the endocranial of Ateles and the cerebral of the hoolock. Pratically the bulk of the brain of both Monkeys is corresponding and we can see fully how they are alike in outlines and bulk (119).

CONCLUSIONS

I

There is not a quiet consensus on the division of the Platyrrhine into Families ; there are many interpretations in face of the bulk of variations. It is known that irruption of teeth proceeds from before backwards ; and the irruption of milk teeth Platyrrine pm $\frac{2}{2}$, at the same time of the three normal molars, when variation in its teeth is stronger in the absence of last molar, reveals the evidence, of the provenance of that monkeys as having once attained the same dental formula of the Catarrhini, from where they returned lowering backwards.

II

Highness of the frontal bone, development of frontal lobes and bulk of brain in Ateles, Brachyteles and perhaps Lagothrix, aside orthogradism in *Ateles* and many other characters exhibited by both groups, shows further *Ateles* and Brachyteles nearer the simioid group of the Gibbons, than even the Colobi which are the pithecoid more akin to them in other views.

III

Theese facts are too much strong to be explained by parallelism ; sure they reveal rather more an originary kinship than any other explanation.

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(118) There is not any scale to the figure, therefore I am supposing it a natural — size one, under the numbers up given of the brain case of the Hoolock.

(119) Whereas to the "cephalisation" it is enough to see what says Freschkop on "Annales de la Soc. Zool. de Belgique, tome LVIII, 1927. He founds 84, for *Pseudocebus*.

IV

Notwithstanding in their actual existence other Platyrrhine have been especialised through the many factors considered, perhaps the green light interference, some endocrinal modification of their pituitrin ; and they are the actual lowered recalling of theirs old ancestors — the Lemuroids and sometimes the Adapine.

V

Following logic the place of birth of the Catarrhine Monkeys is the North-American soil.

VI

Any eventual division of the Platyrrhine Monkeys into Families, in our actual knowledge of theese monkeys, will not be a natural one ; it is better to stand into the wise reserve of Winge and many other Fathers of the Zoology. The author sees eight Sub-Families in wich they may be tabulated.

PLATE 1

Skull of the *Callimico* from the Yaco, a male exemplar preserved in the Pará Museum

Figure 1 — Lateral view

" 2 — Anterior view

" 3 — Upper view

" 4 — Under view

" 5 — Back view

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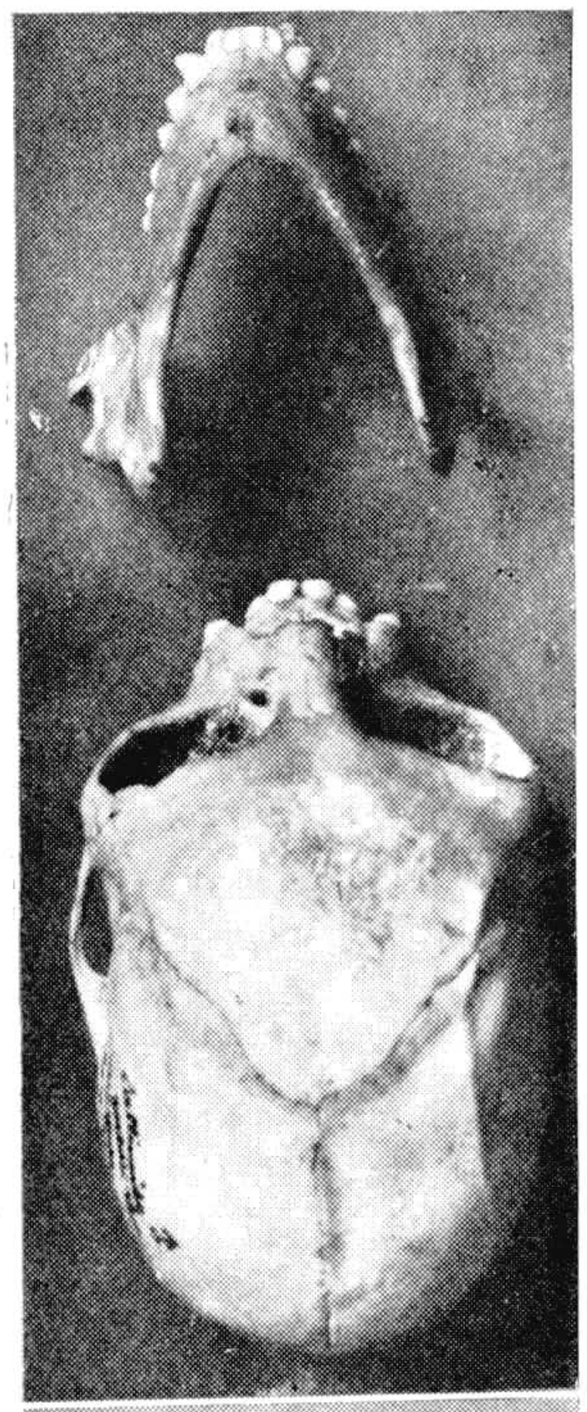

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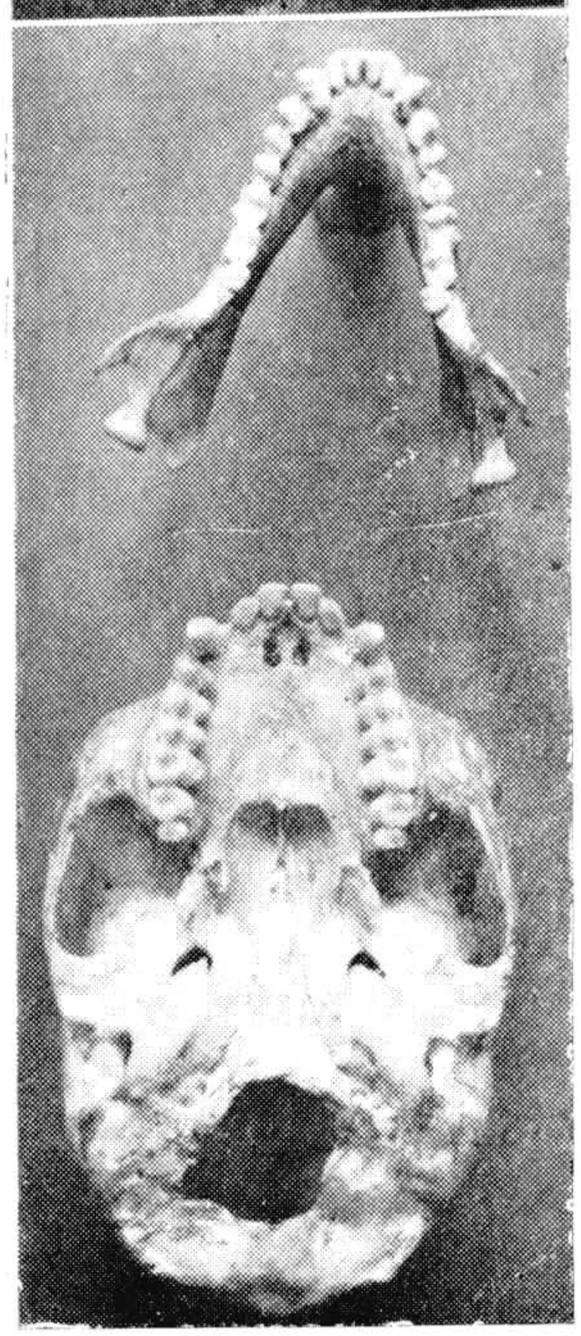

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PLATE 2

Stuffed skin of *Callimico* from the Yaco, preserved in the Pará Museum

Figure 1 — Ventral side

" 2 — Dorsal side

Note the light rings on the tail and loins, which do not existed in the type preserved in the British Museum, at least when the author saw him at the Pará Zoo (1911). Note also the transverse stripe (rufous) on the crown.

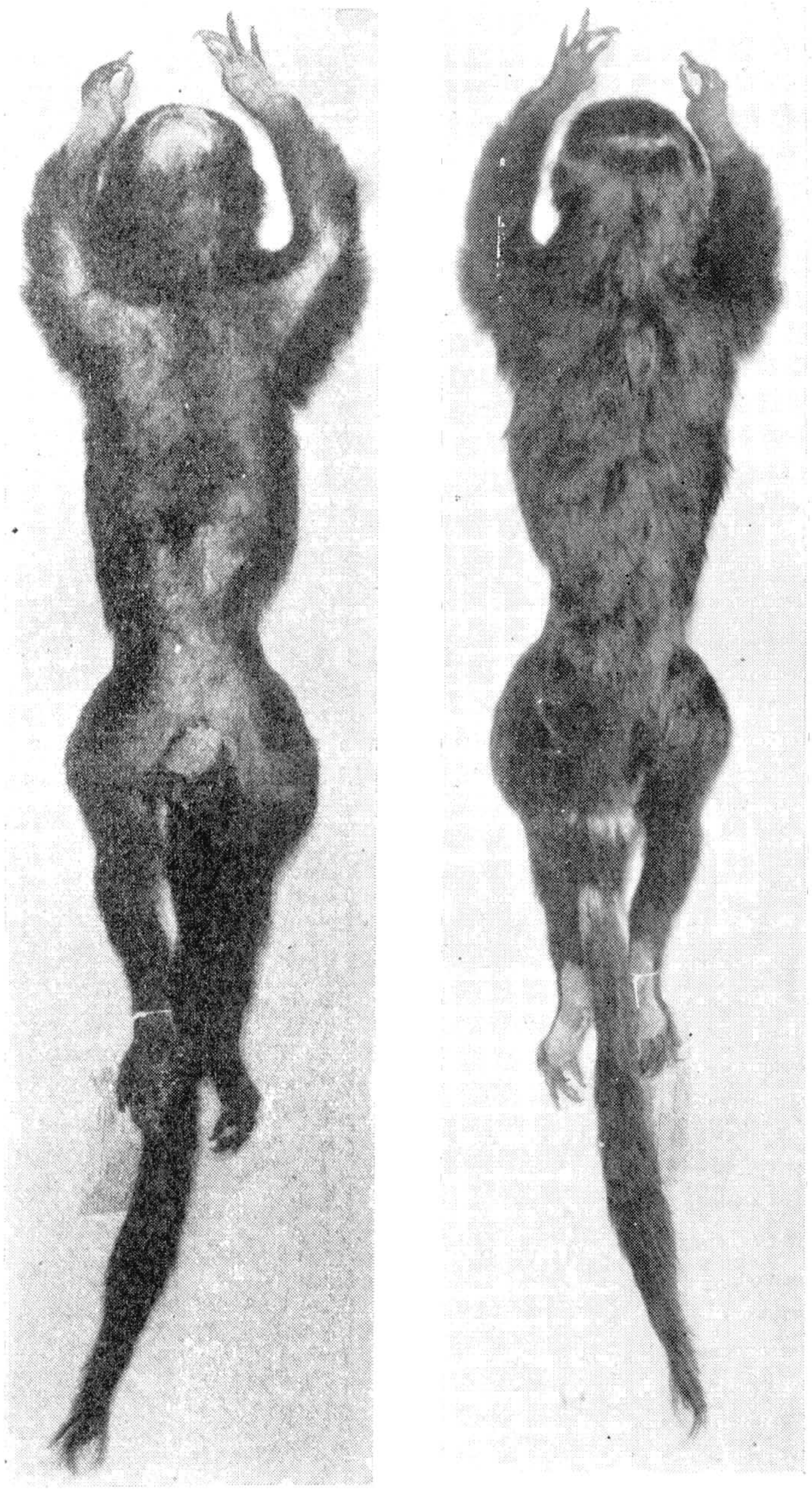

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PLATE 3

Aotus vociferans (Spix) — 3/4 view from a stuffed exemplar in the Collections of the National Museum of Rio de Janeiro, Brasil, South America. Photochrome by the author and Paulo de Miranda-Ribeiro.

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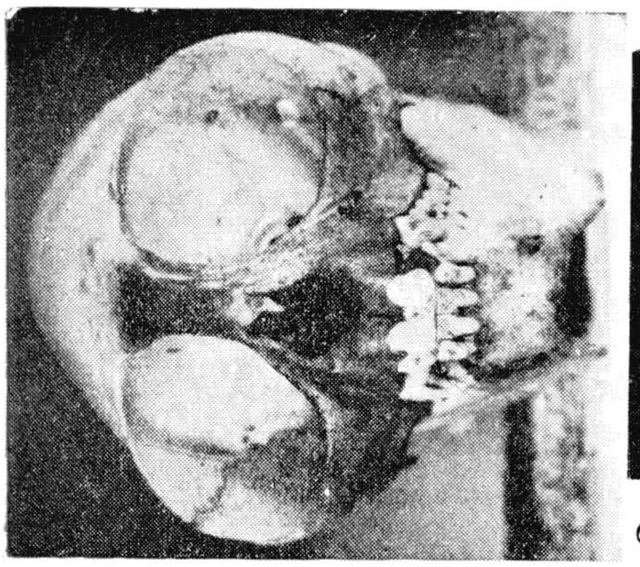
PLATE 4

Figures 1-2 — *Aotus azarae* Humboldt — Skulls of full-grown from Pará (determined in the British Museum by late Olfield Thomas). Photo by the author.

Figures 3-5 — *Aotus azarae* Humboldt — Skulls of young (lactant) collected with its mother, by the author, at the left bank of the Jaurú River, Matto Grosso. Brasil. (See "Mammiferos da Commissão Rondon", 1914, pg. 14). Photo by the author.

Figures 6-7 — *Callicebus egeria* Thomas — Skulls of an exemplar from the British Museum (number 8-6-9-10), to be compared with the young *Aotus*. By the photograph of the British Museum.



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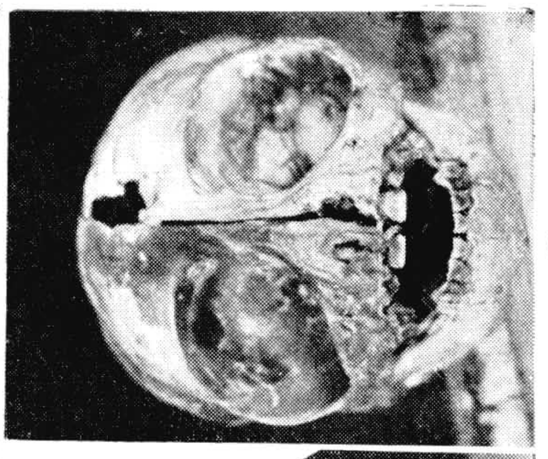

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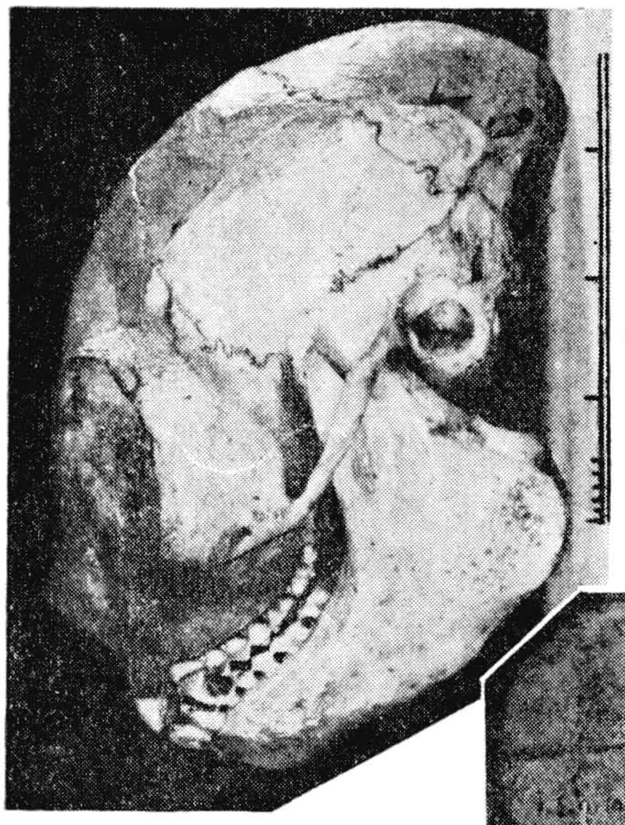

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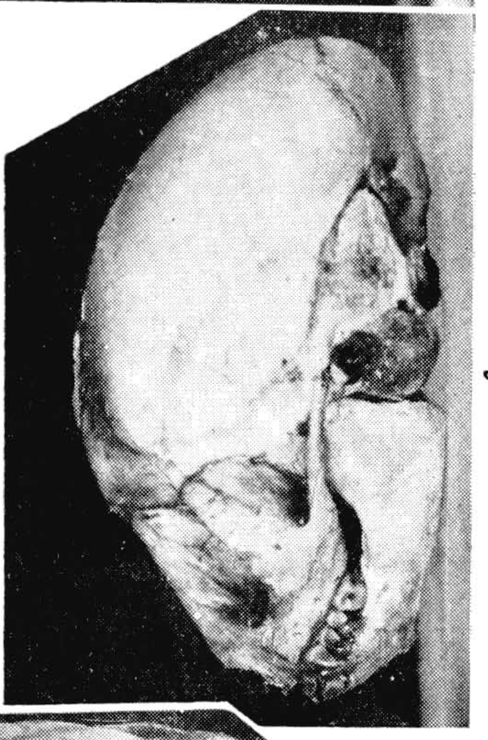

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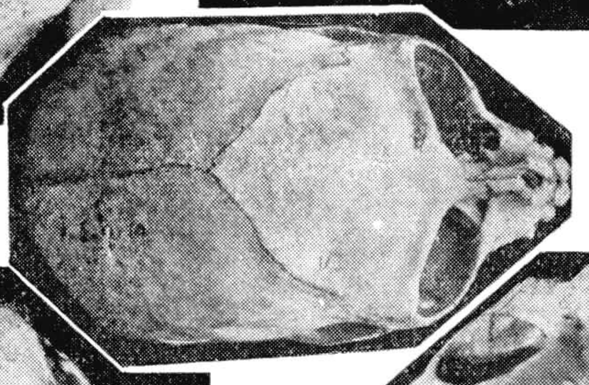

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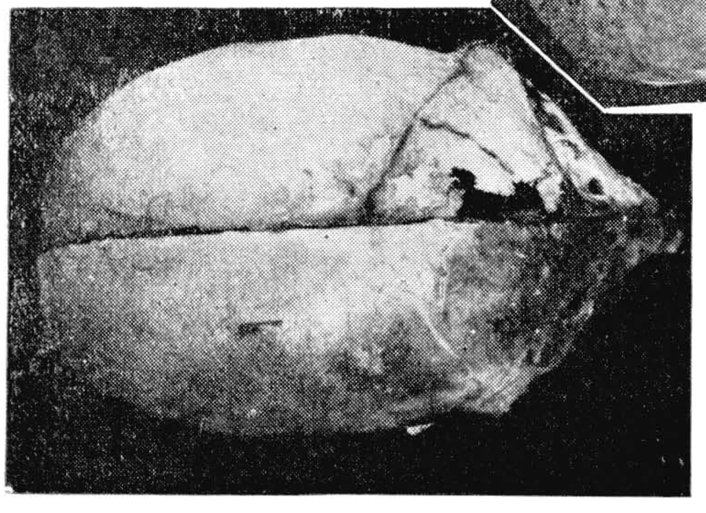

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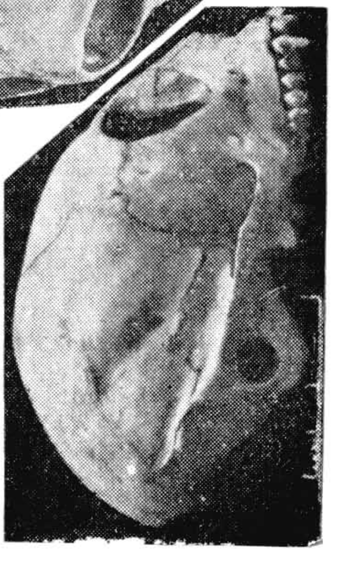

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PLATE 5

Figures 1-2 — Lateral and under views of the mandibles of *Callicebus*

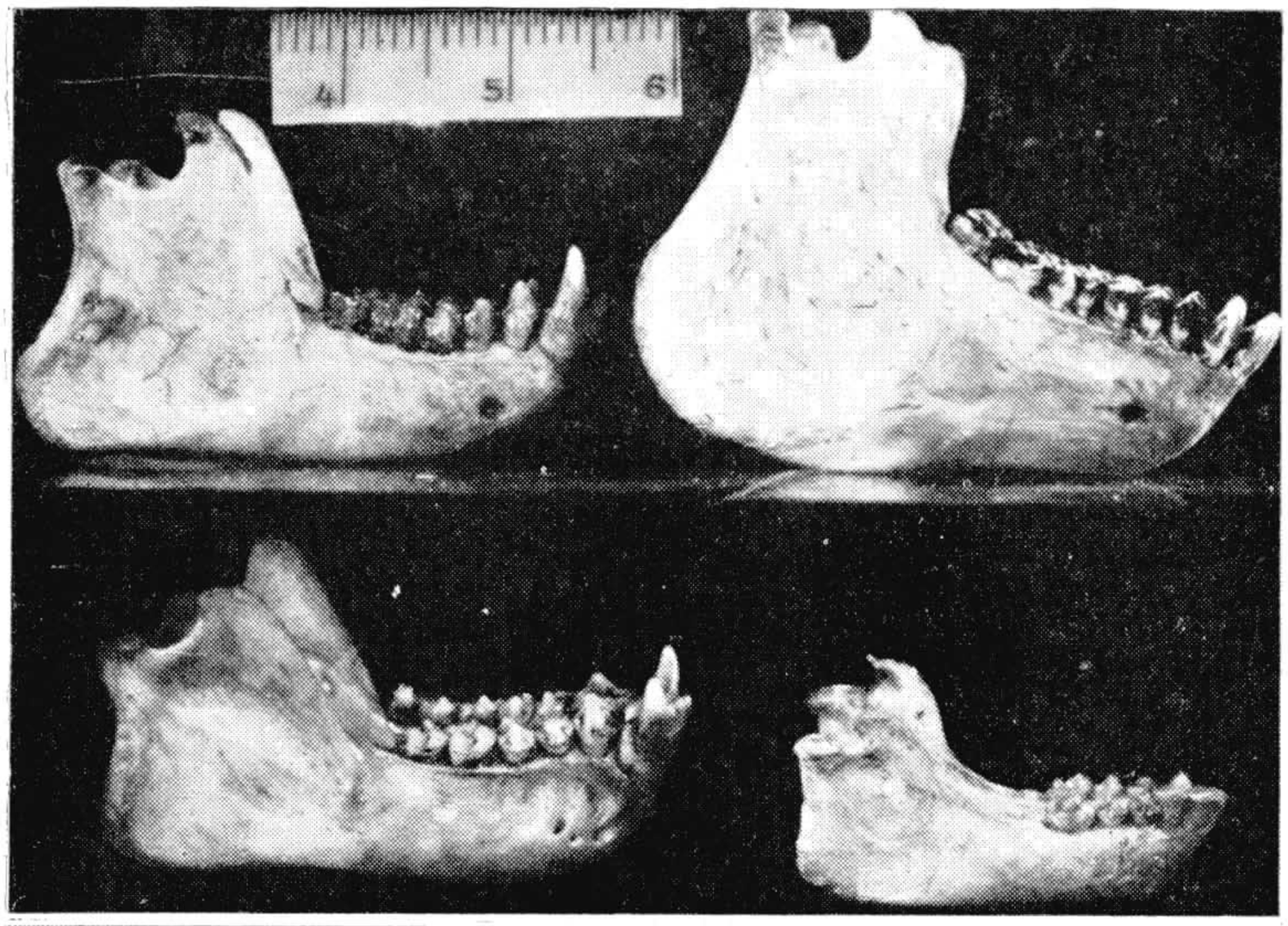
Figures 3-4 — Lateral and under views of the mandibles of *Aotus* (lactant)

Figures 5-6 — Lateral and under views of the mandibles of *Leontocebus*

Figures 7-8- — Lateral and under views of the mandibles of *Saimiri*

All the figures in the same scale, to show the two main types of mandibles in the South American Monkeys. Photos by the author.

5



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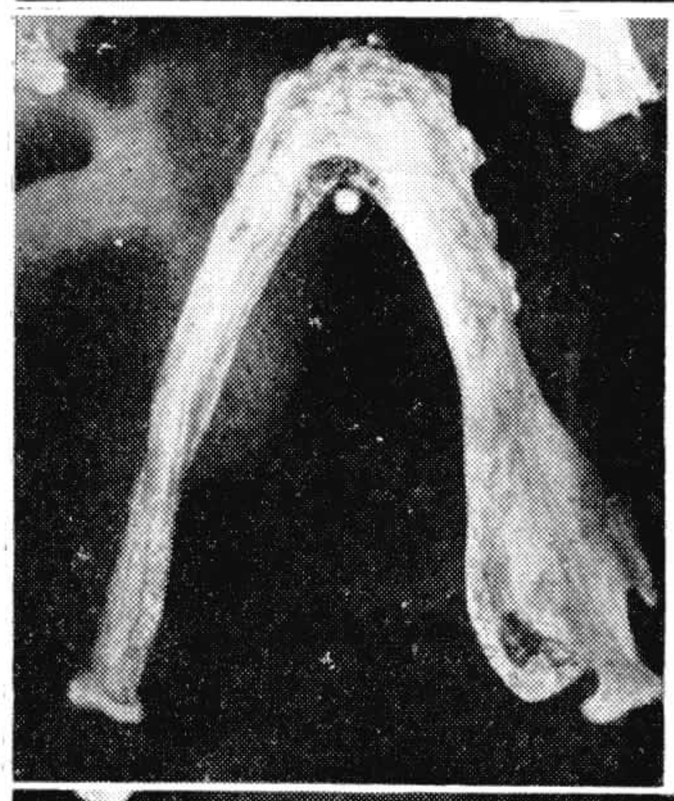

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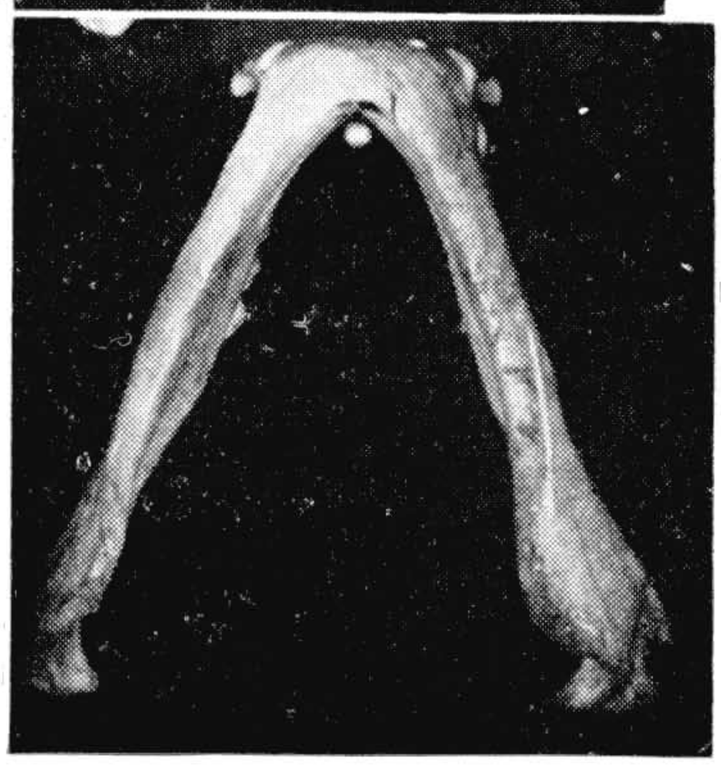

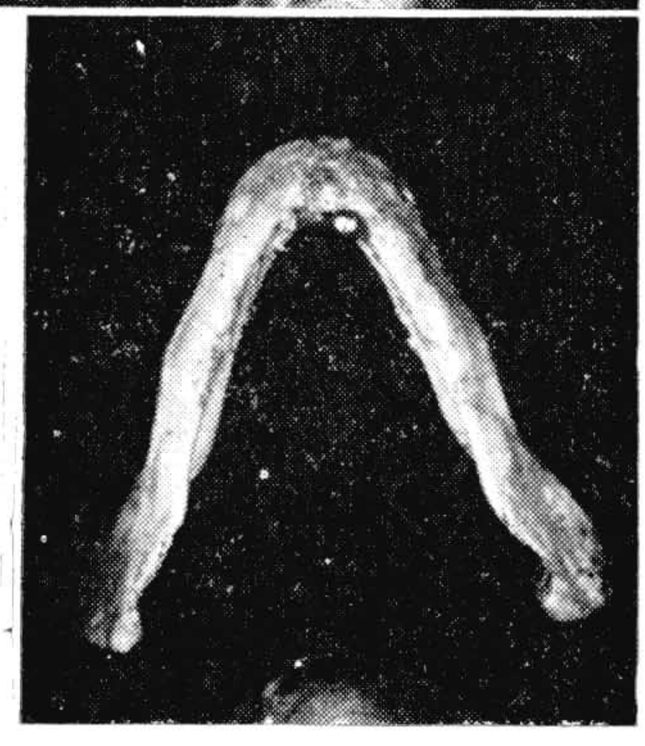

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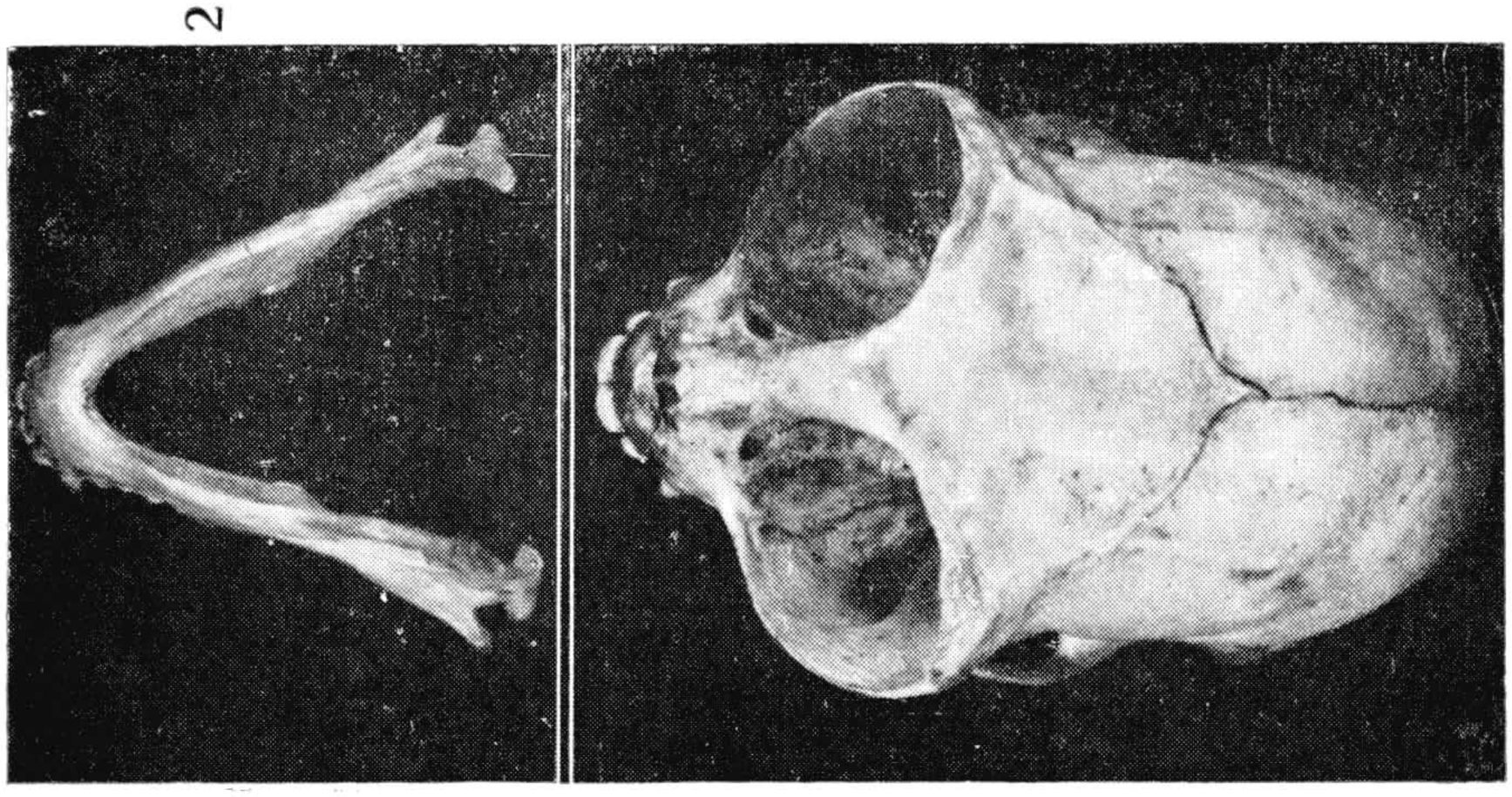
PLATE 6

Figures 1-5 — Skull of *Aotus trivirgatus* Humboldt, to be compared with the figure 6. Photos by the author.

Figure 6 — *Callicebus remulus* Thomas — Side view of one specimen number $6\frac{7b}{1}$ 19 from the British Museum. By the photograph of British Museum.



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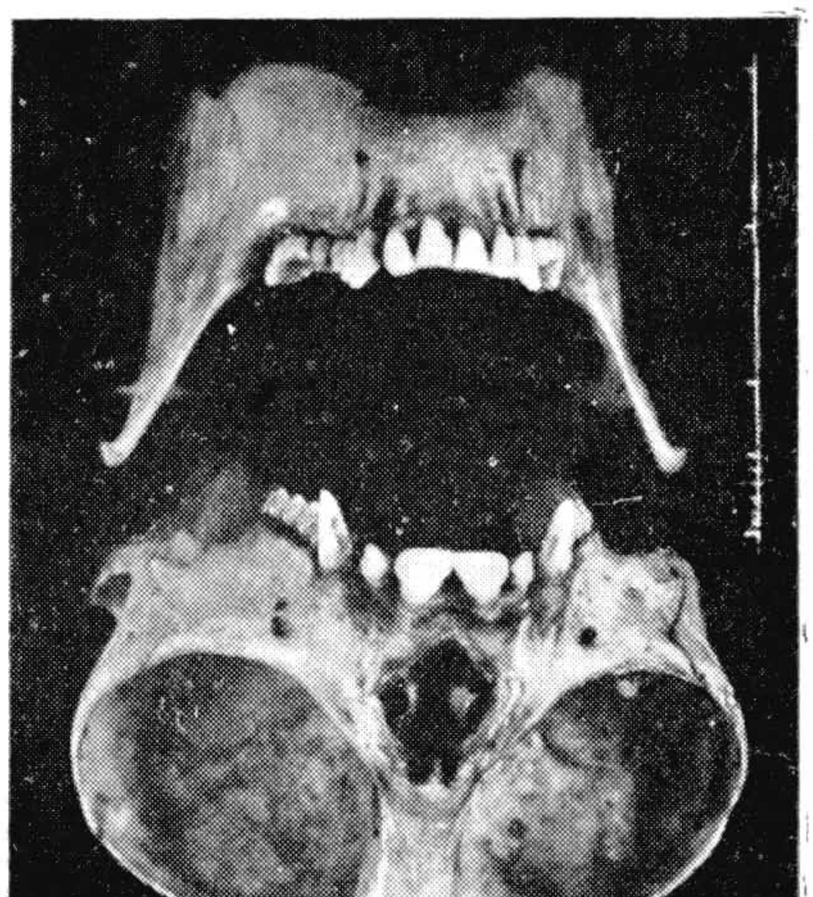

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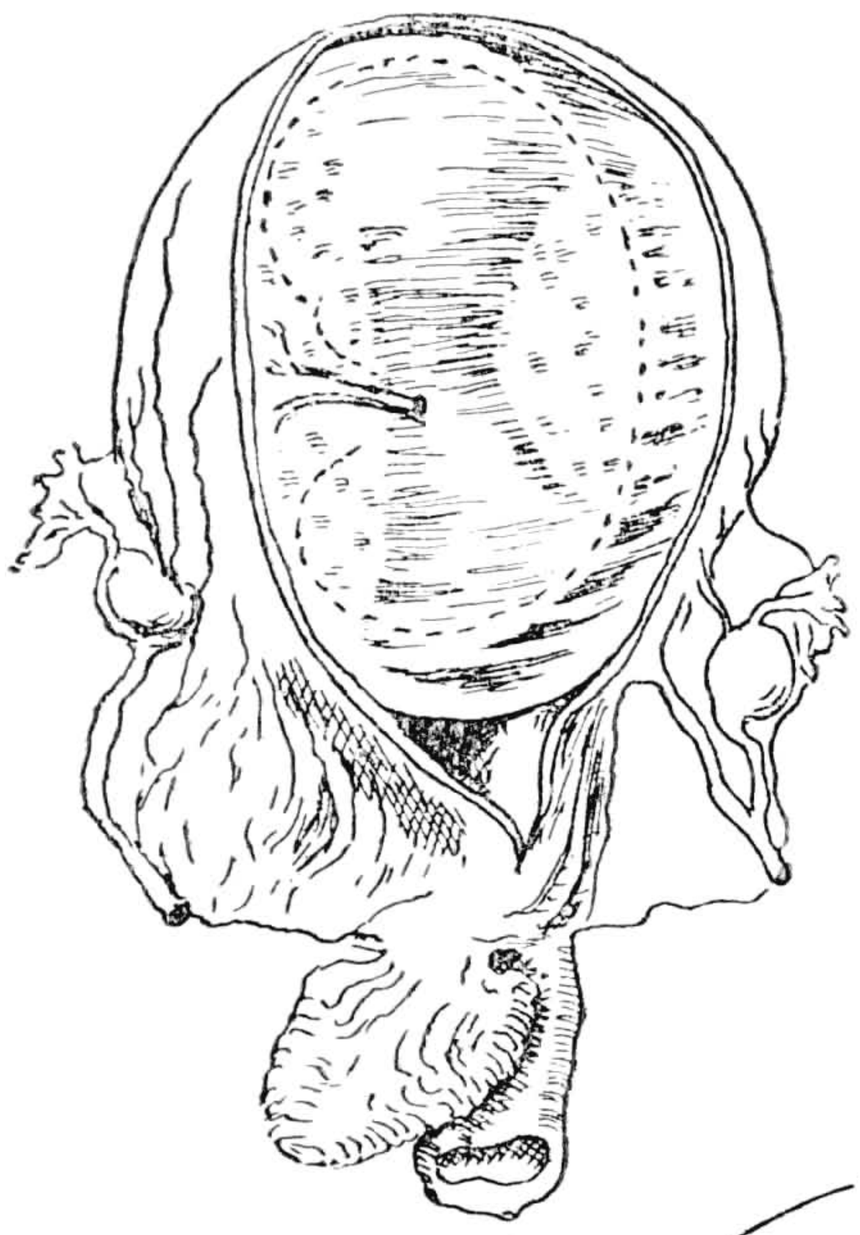
PLATE 7

Sketches of the uteri and placentae of *Callithrix* and *Cacajáo*. *By* the author.

Figure 1 — Of *Callithrix albicans* (Gray)

Figure 2 — Of *Cacajáo calvus* (Isid. Geoffr.)

Figure 3 — *Cacajáo calvus* (Isid. Geoffr.) — Implantation of the umbilical chord on the right (greater) body of the placenta, where comes also the blood vessels of the left one (the lesser).



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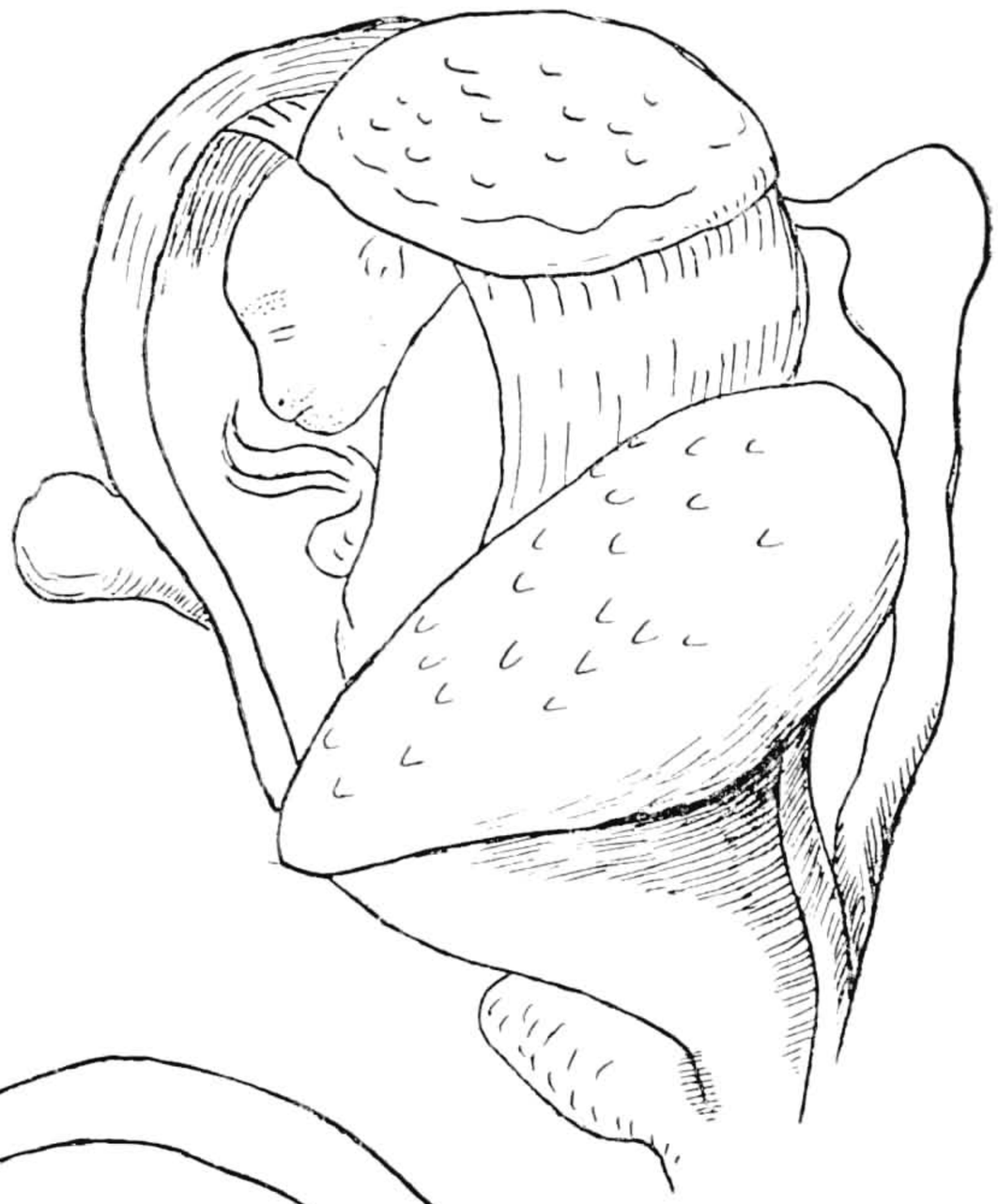

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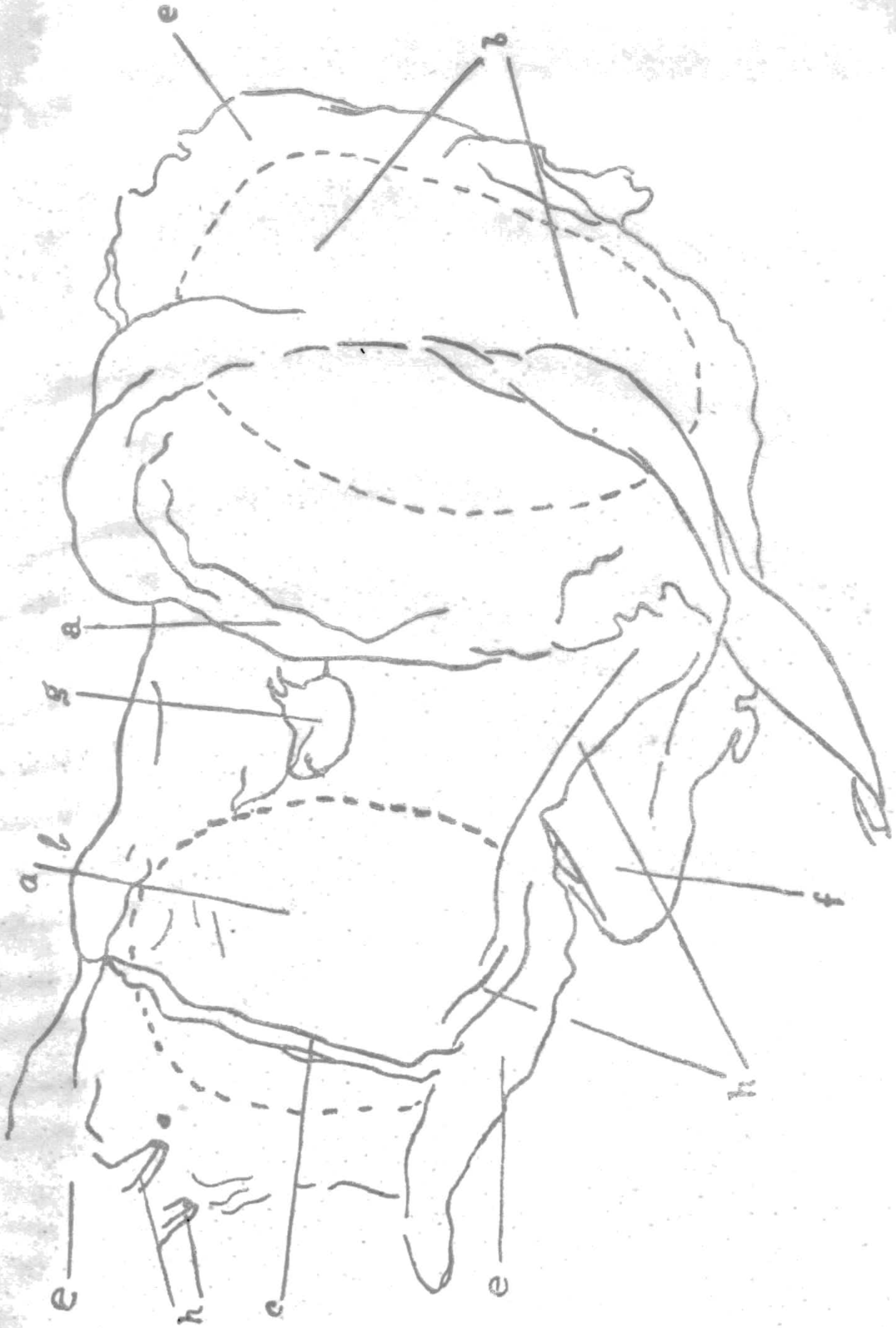
PLATE 8

Callithrix albicans (Gray) — The egg, of pl. 7, fig. 1, opened, with the foetus extruded, showing the membranae, as explained in the text. Magnified. Photo by the author.



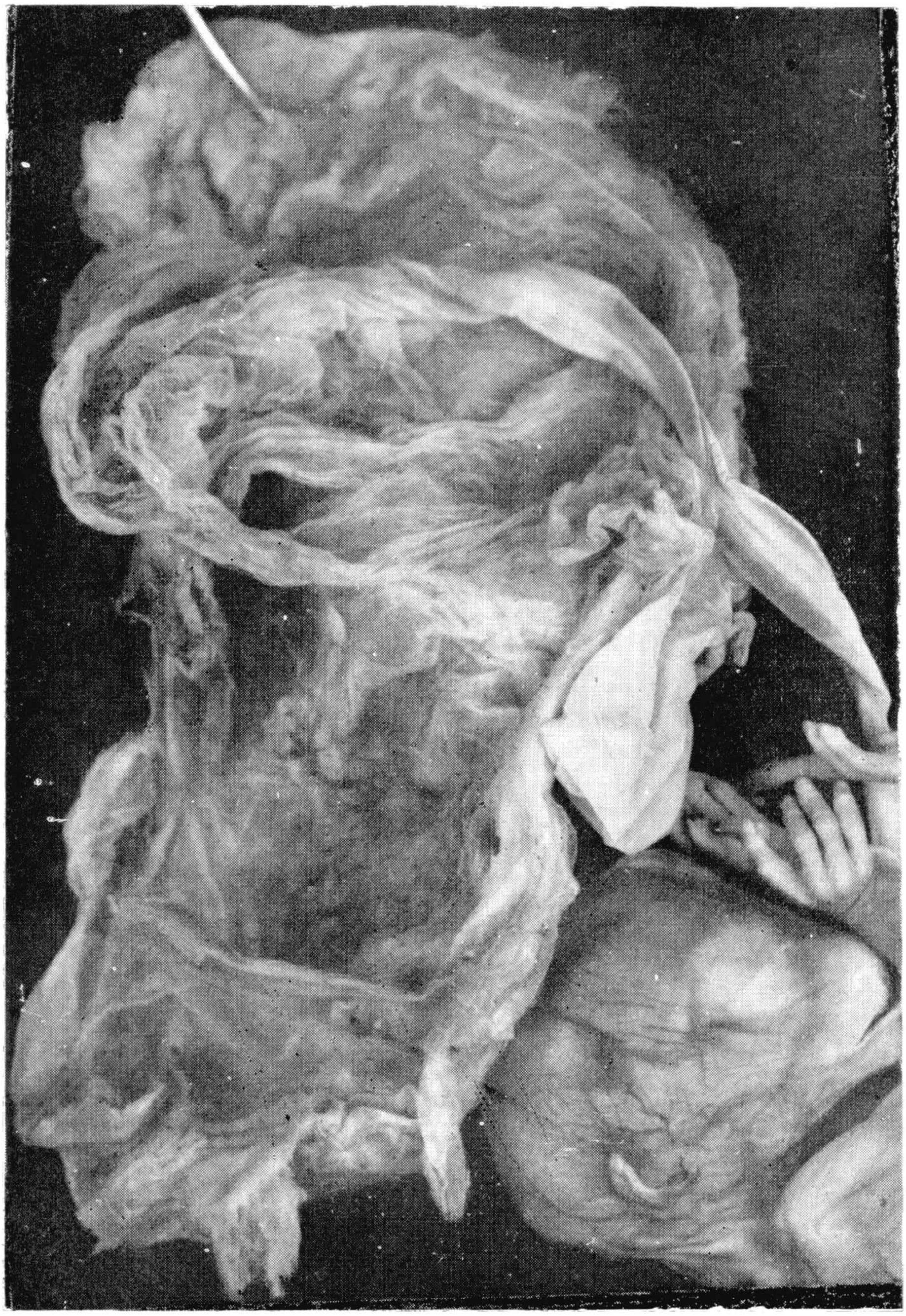


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PLATE 9

Callithrix albicans (Gray) — The foetus, magnified, in order to show the blakish dots of the future hairs and small details. Photo by the author.

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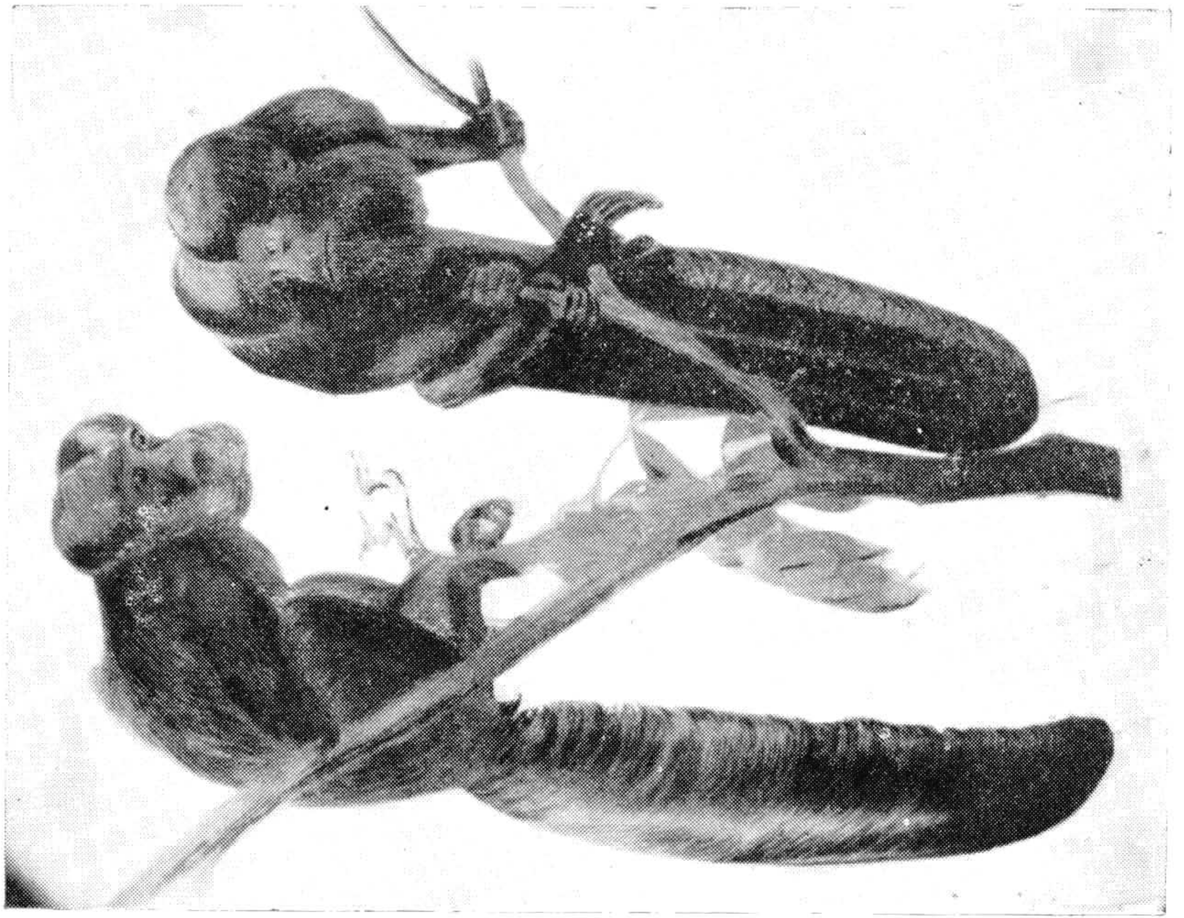
PLATE 10

Figure 1 — *Chiropotes chiropotes* Humboldt, full-grown, freshly killed, from Manáos. Photo by Carlos Hamann sent over to the author 1900.

Figure 2 — *Chiropotes satanas* (Hoffmansegg), from life (Pará). Male and female. From a photochrom of the author.



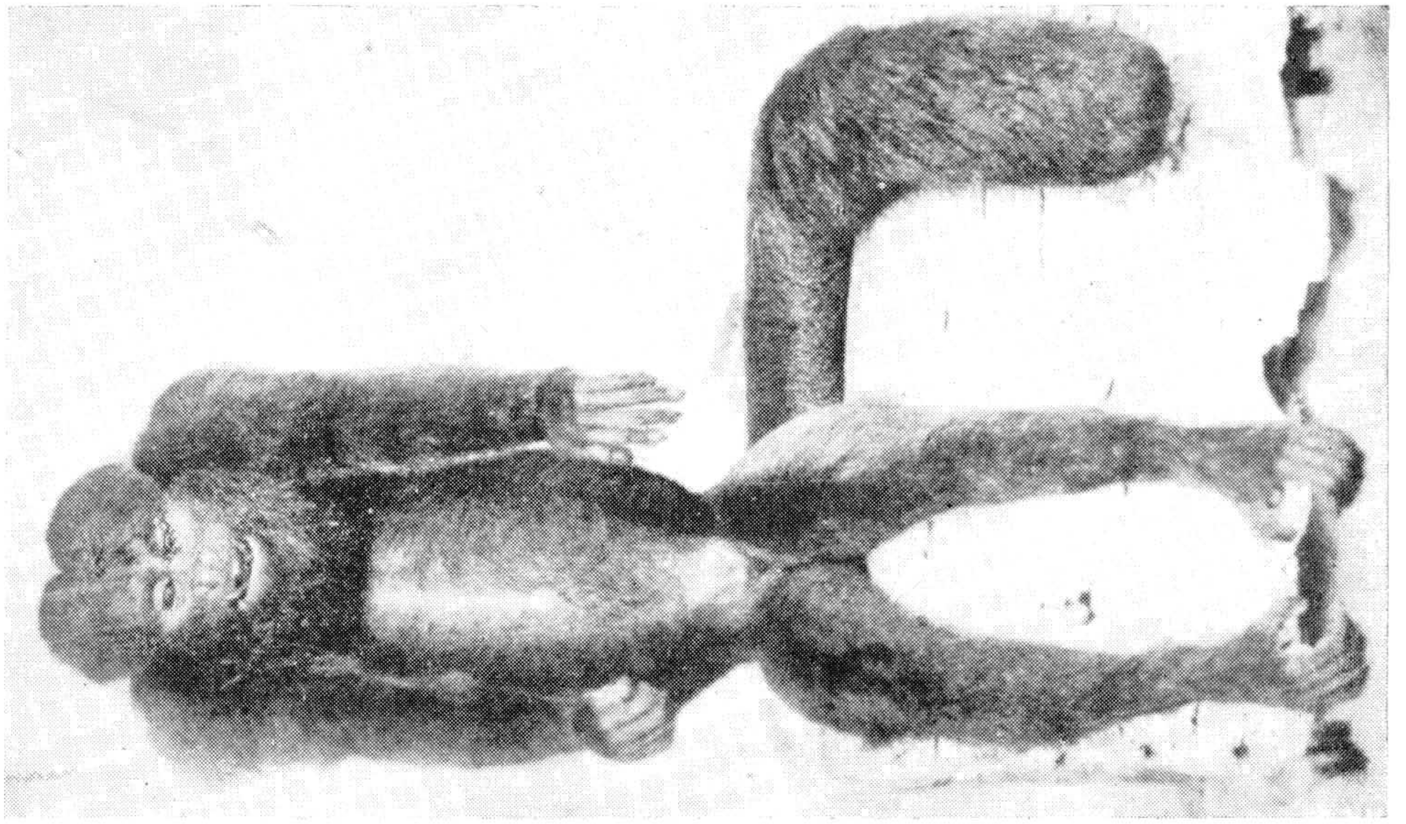


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PLATE 11

Figure 1 — *Cacajão rubicundus* (Isid. Geoffr.), freshly killed. Photo by Freitas.

Figure 2 — *Yarkea chrysocephala* (Isid. Geoffr.), alcoolic exemplar. Photo by the author. Please remark the wirth of the septum of the nares.

Figure 3 — *Neocothurus*, from life. Photo by C. Lako.

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PLATE 12

Cebus fuscus (E. Geoffr.), from the Organ Mountains, at Therezopolis, E. do Rio. Full-grown male's face-view. Photo by the author.

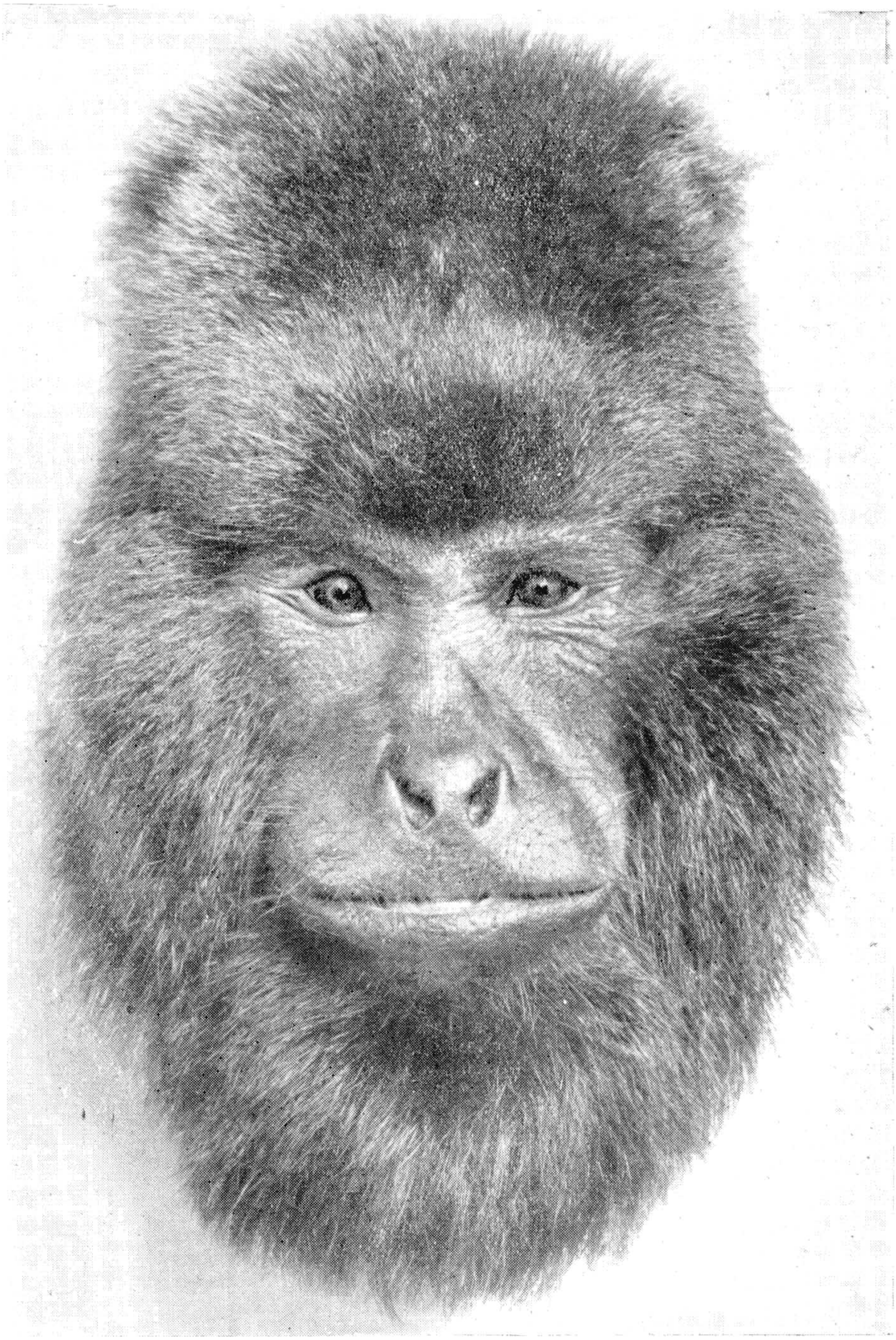

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PLATE 13

Figures 1-3 — *Brachyteles hypoxanthus* (Desm.) from Minas Gerais. Courtesy of Dr. J. Moojen. Agricultural School of Viçosa, Minas.

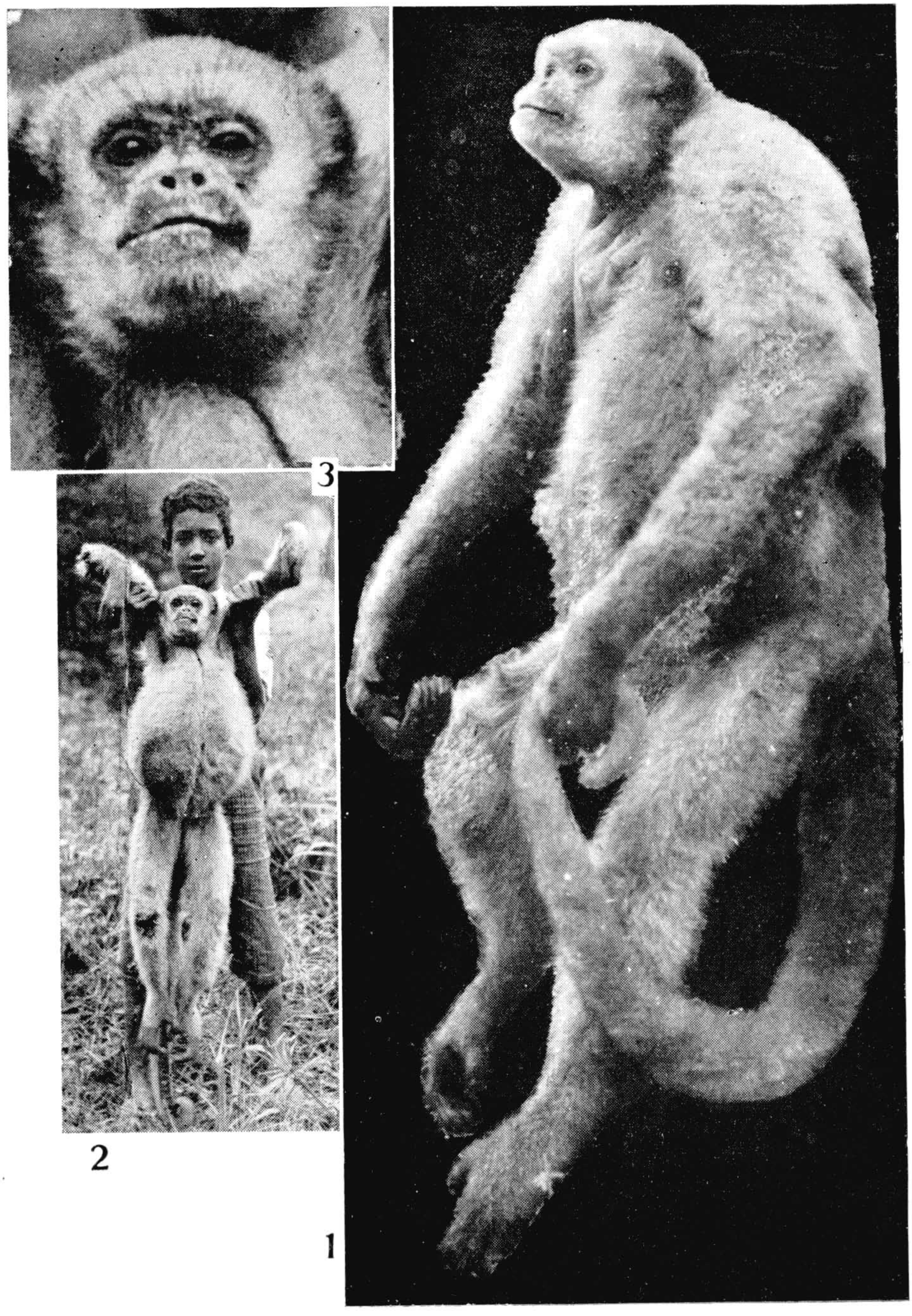

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PLATE 14

Figure 1 — Copy of the skull of *Homunculus patagonicus* Ameghino, deposited at the Anthropol. Section of the Museum ; view at 3/4 left side.

Figure 2 — Palatal view of the same.

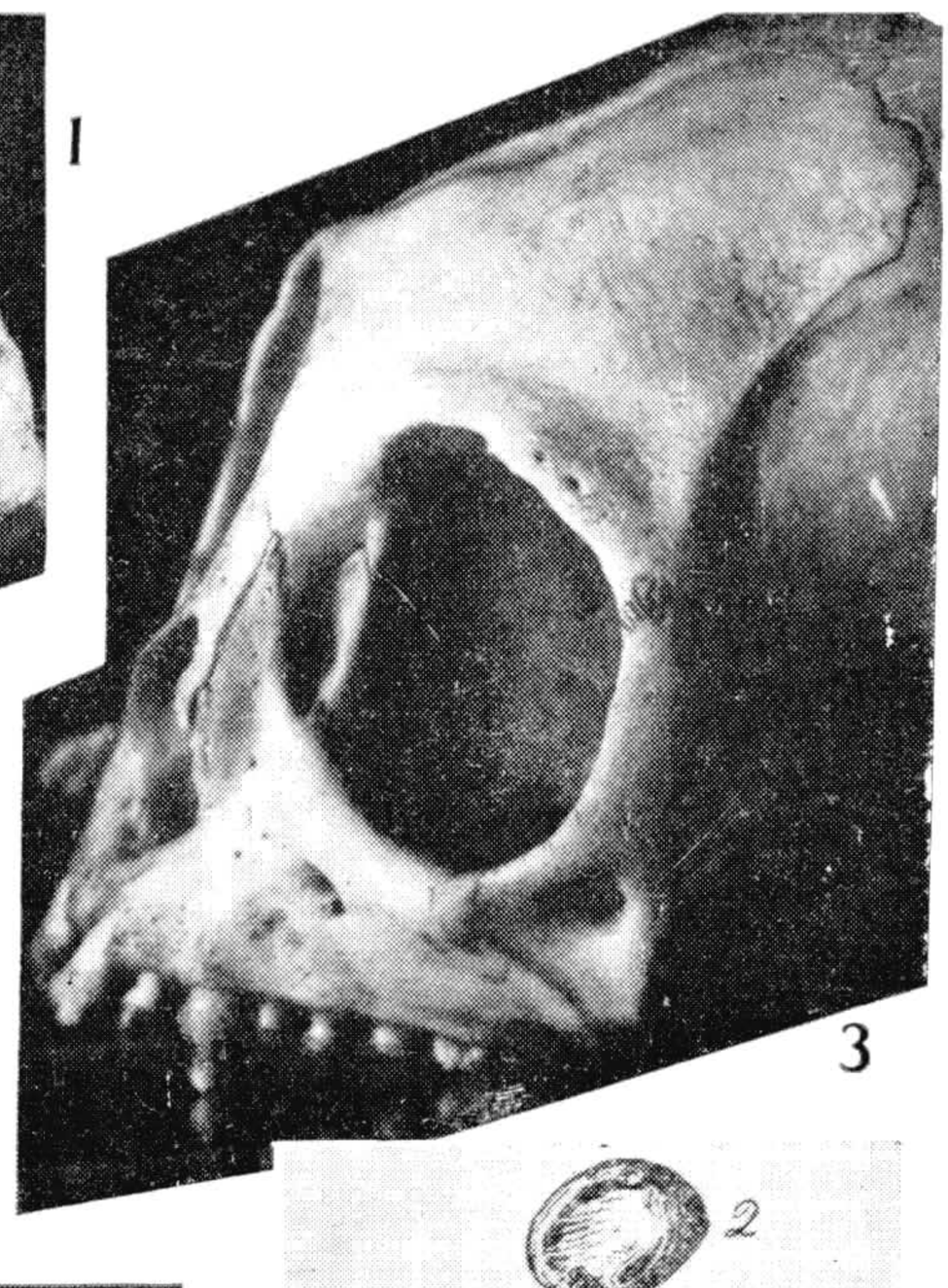
Figure 3 — Side view of a skull of *Callicebus,* to be compared with the same projection of fig. 1.

Figure 4 — Palatal view of *Callicebus personatus* (E. Geoffr.) in order to be compared with fig. 2 and show identity of measures.

The four photos under same scale as seen under fig. 1.

Figure 5 — Photo-copy of the fig. 330 (of the lower molar teeth) of *Homunculus* of Ameghino. Photos by the author.

1



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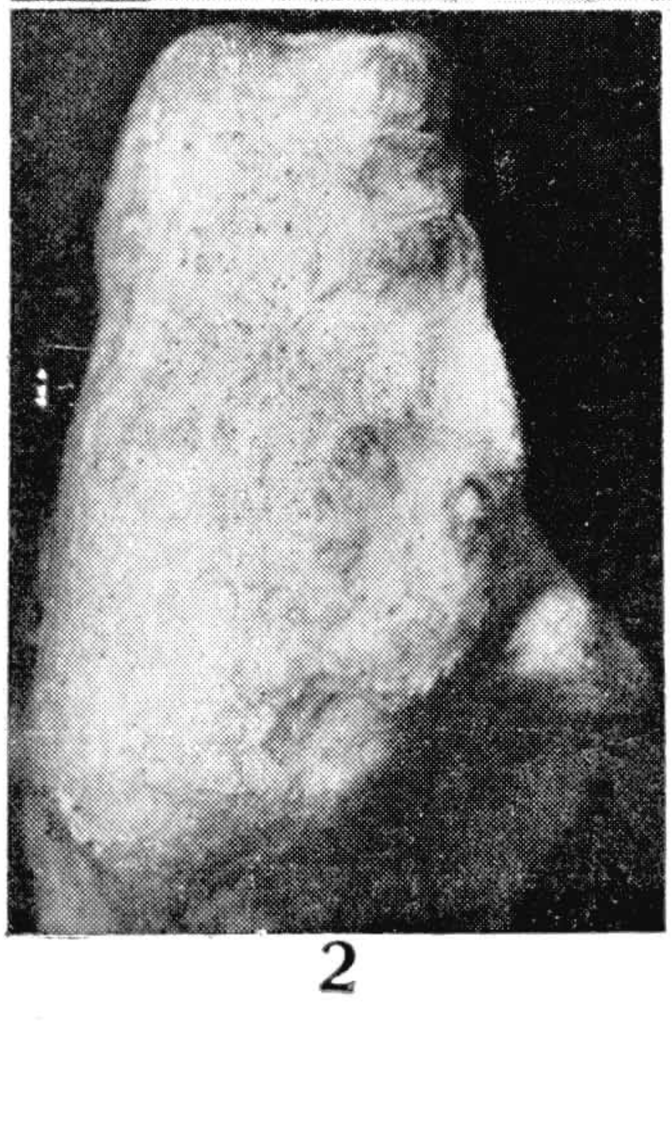

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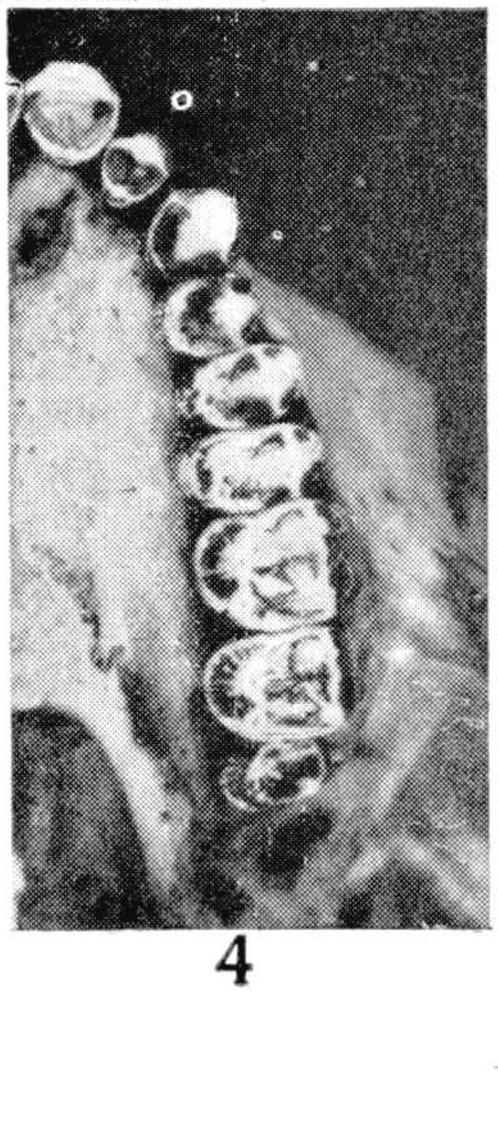

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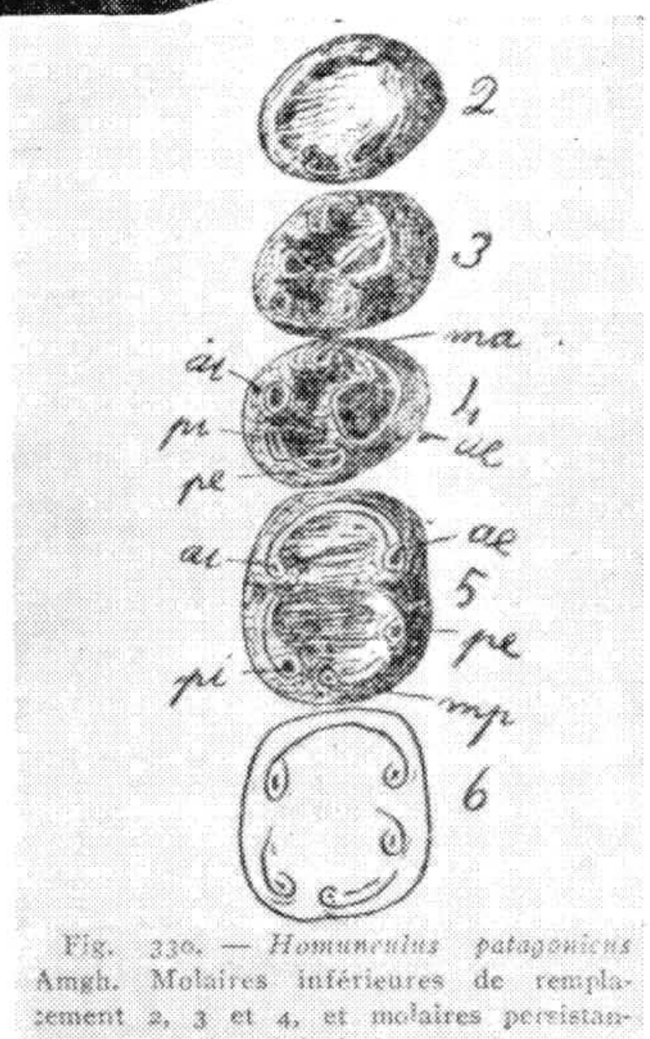


Fig. 330. — *Homunculus patagonicus* Amgh. Molaires inférieures de remplacement 2, 3 et 4, et molaires persistantes 5 et 6 du côté droit, grossies quatre fois. Eocène supérieur de Patagonie.

5

PLATE 15

Figure 1 — Mandibles of *Callicebus personatus* (E. Geoffr.), to be compared with fig. 2.

Figure 2 — The lower jaw of *Homunculus* after the fig. 329, to show the diastems between canines, pm. and incisives.

Figure 3 — Right side of the lower jaw of an young *Ateles paniscus* (L.), still bearing the milk-canines, in order to compare with that of fig. 2.

Figure 4 — Lower jaw of *Ateles paniscus* (L.), full-grown-female.

All these four photos showing the crowns of teeth.

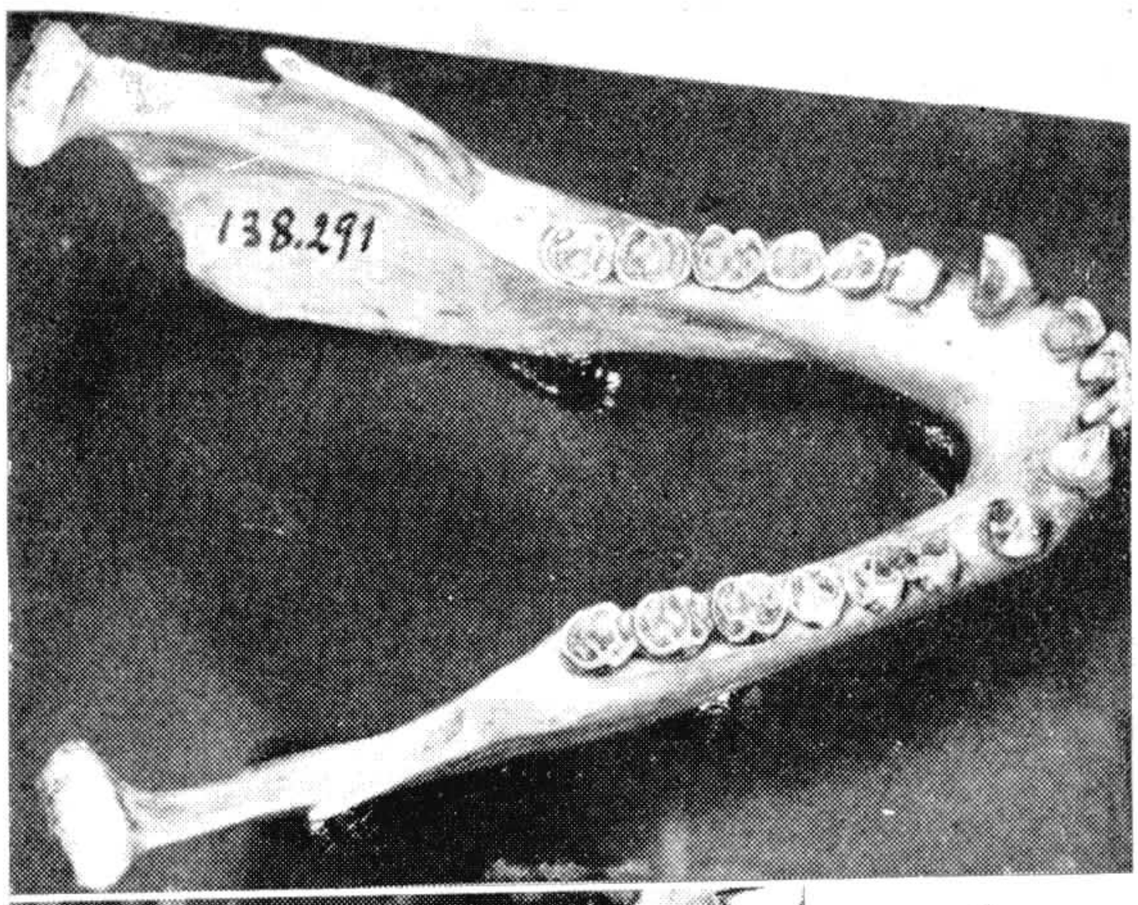
Figure 5 — Lower jaw of *Callicebus personatus* (E. Geoffr.), side view.

Figure 6 — Helio-copy, side view, of the fig of *Homunculus patagonicus* Amegh.

Figure 7 — Lower jaw of *Ateles paniscus* (L.), the same (young) of fig. 3.

Figure 8 — *Ateles paniscus* (L.), full-grown female, the same of fig. 4.

All photos in side view. Photos by the author.



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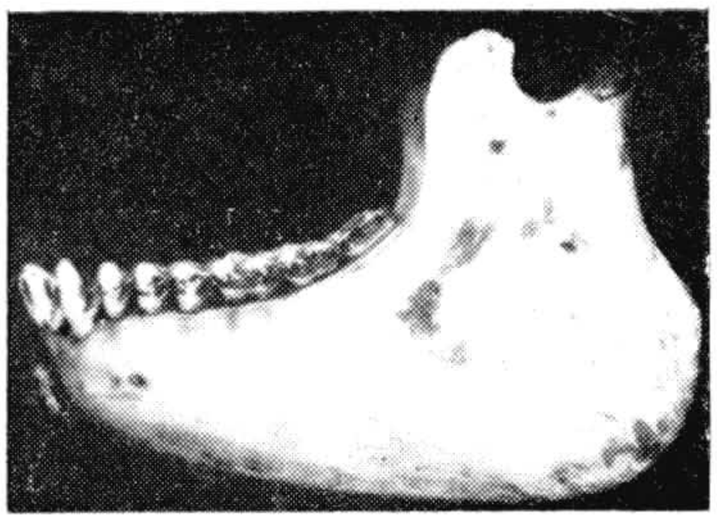

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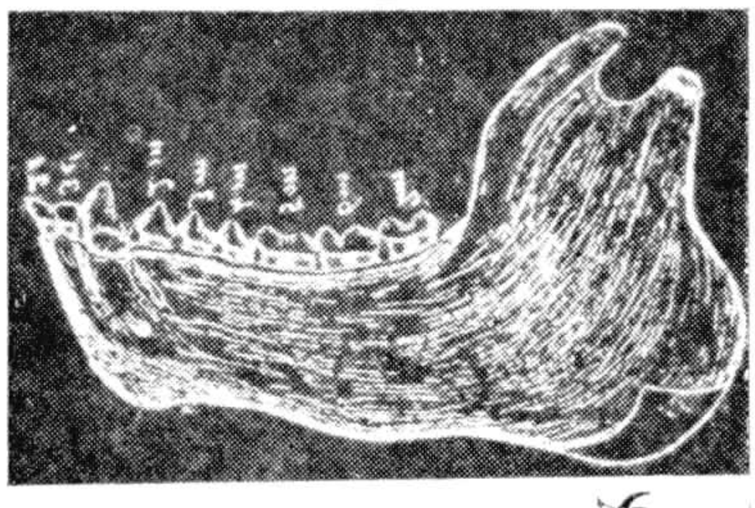

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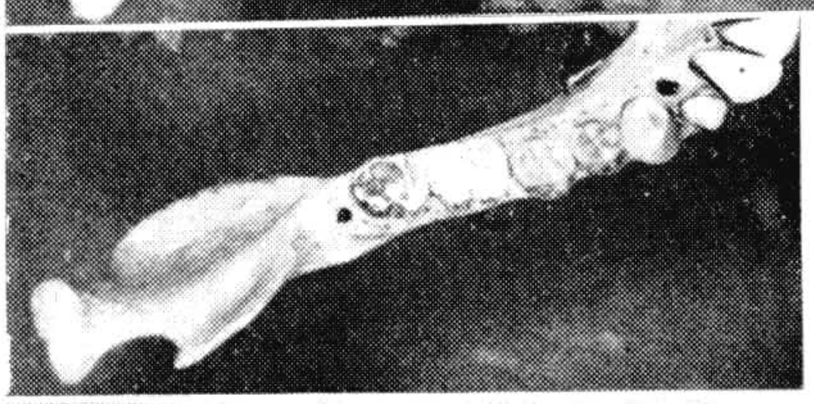

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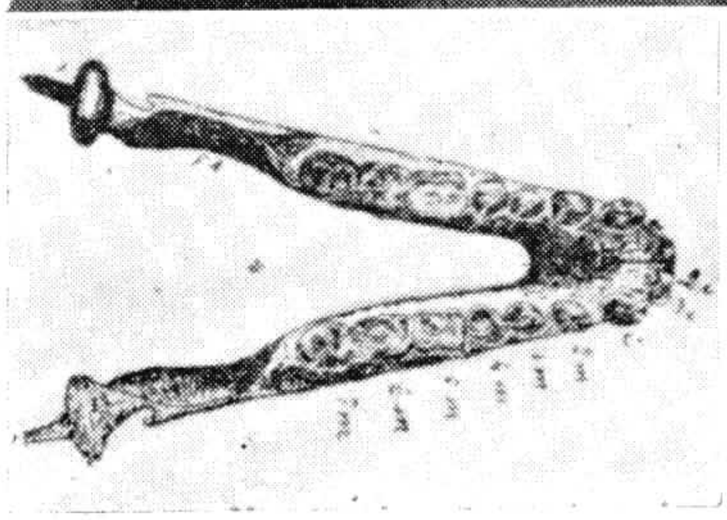

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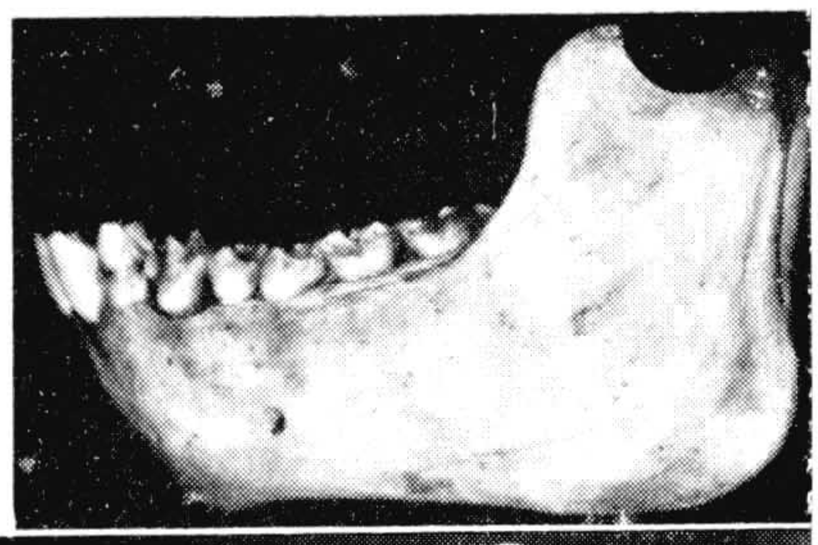

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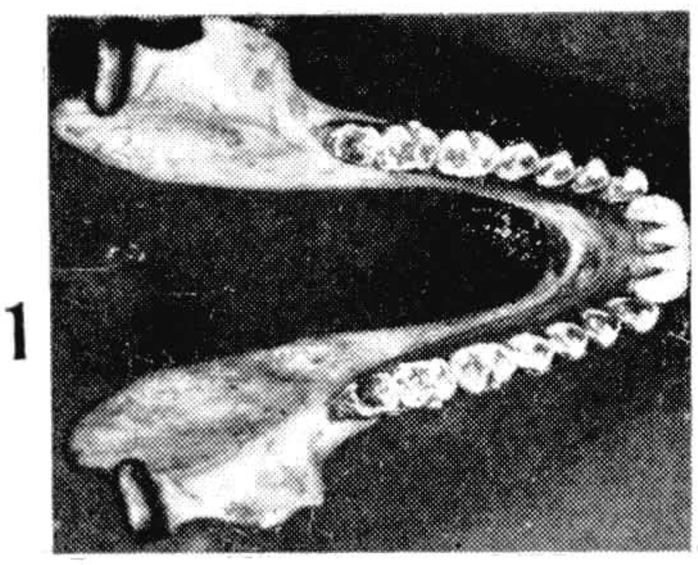

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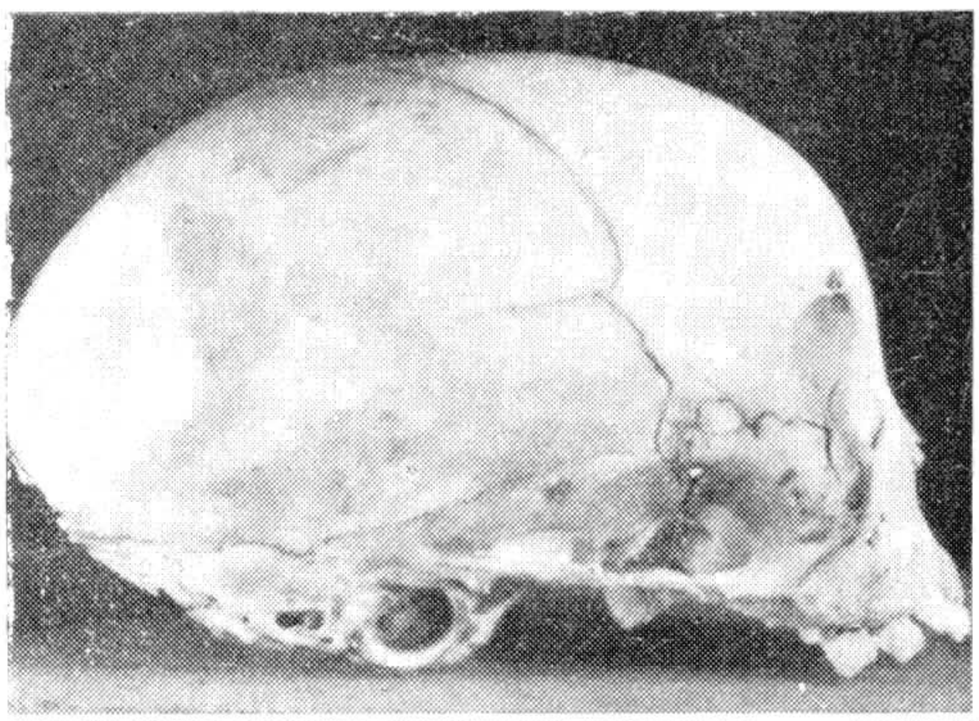
PLATE 16

Figures 1-8 — Skull of a lactant of *Brachyteles* showings a very alike outline of the skull of a human foetus, figured by Sir Arthur Keith in the pg. 668 of the "Antiquity of Man, vol. II, 1925". Preserved in the National Museum's Collection. Photos by A. L. de Carvalho.



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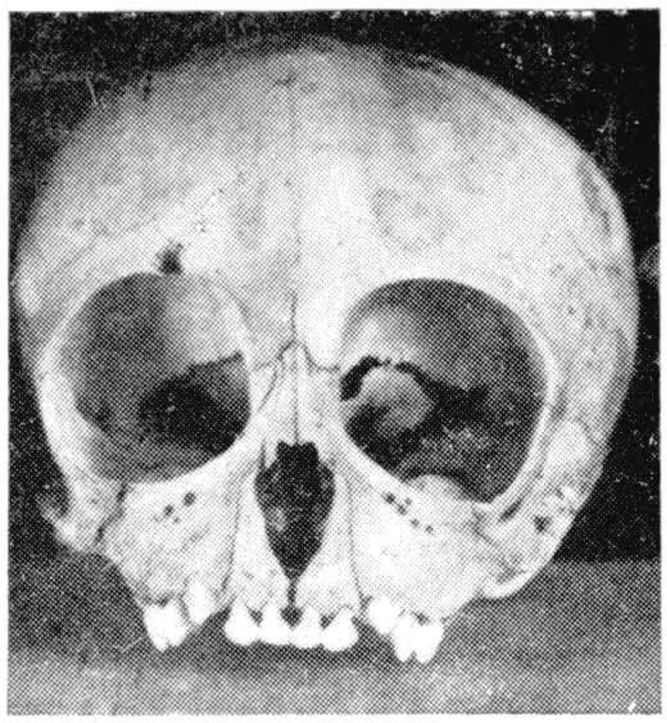

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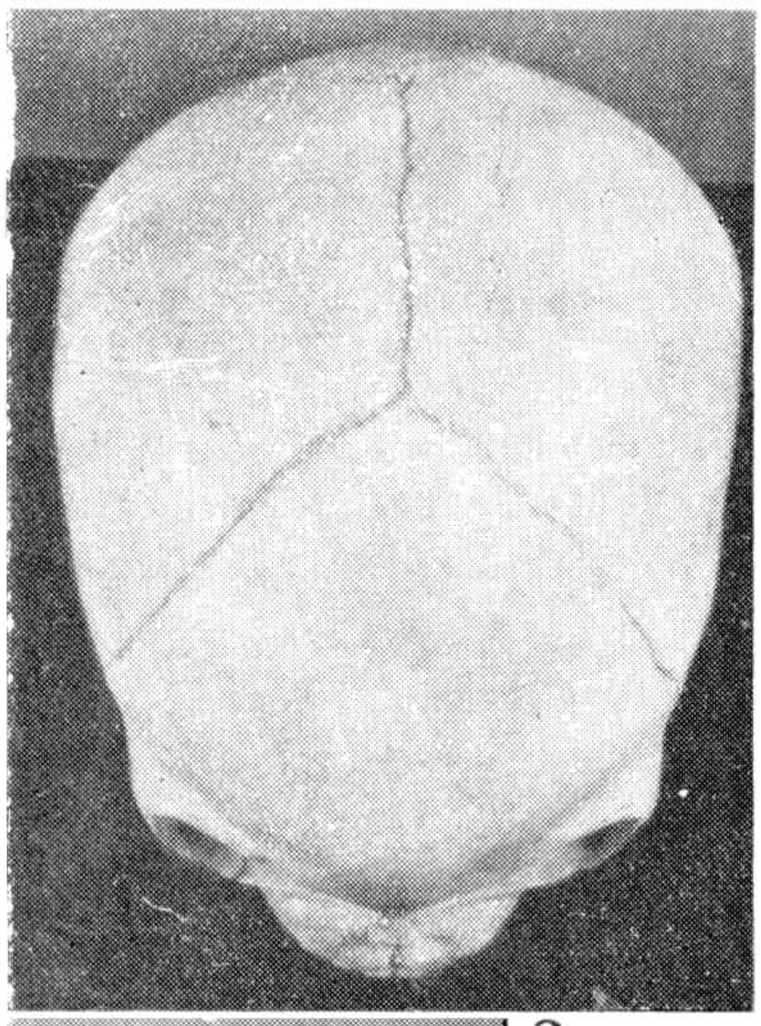

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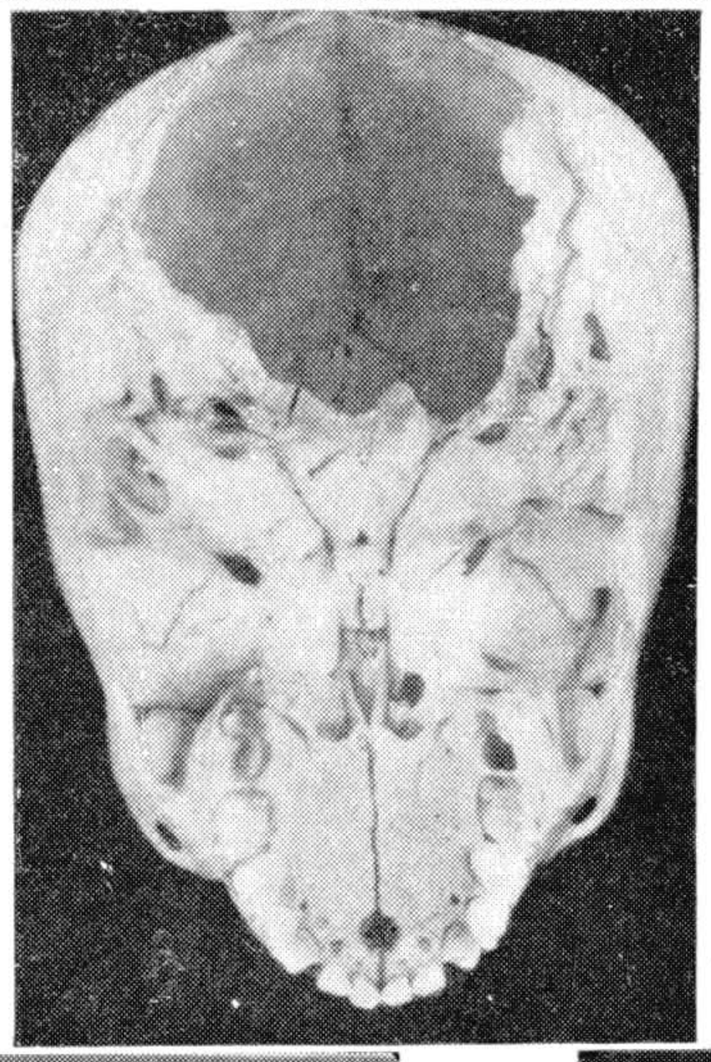

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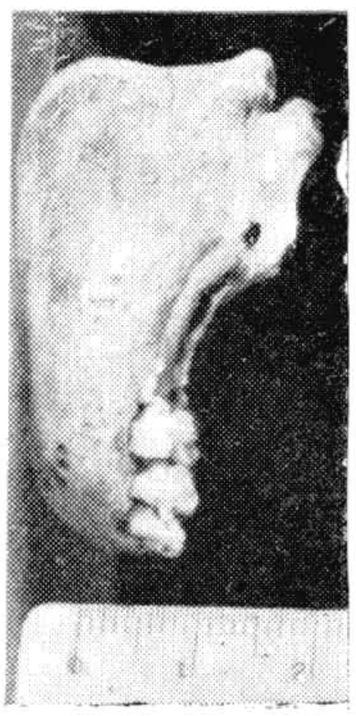

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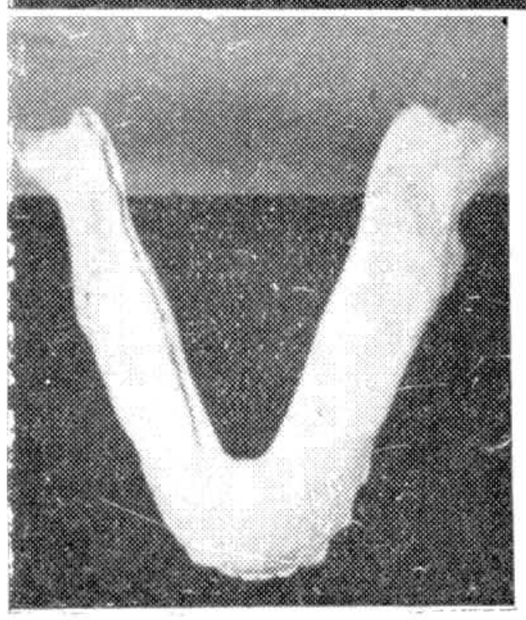

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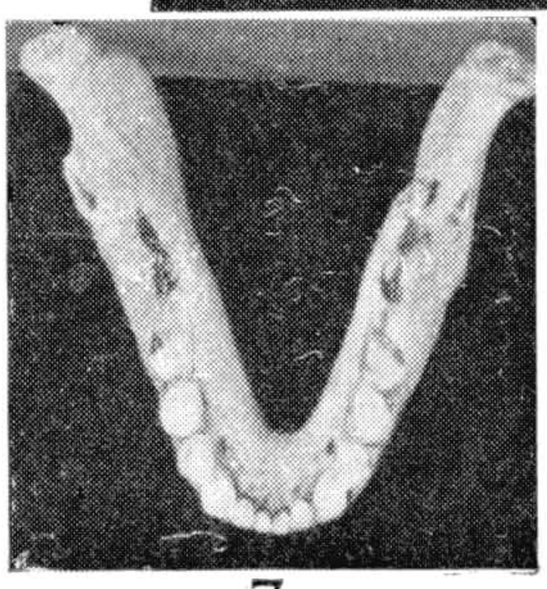

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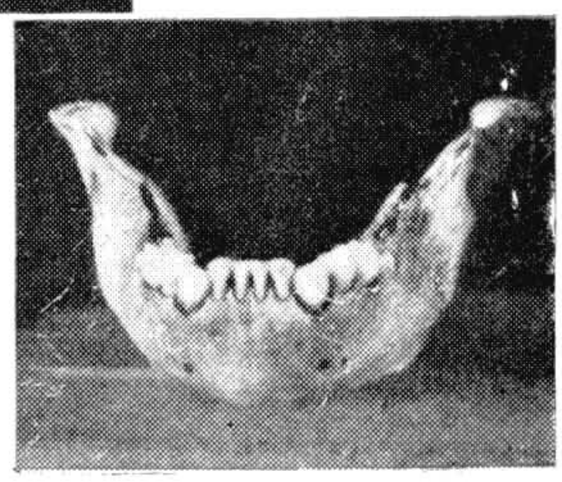

8

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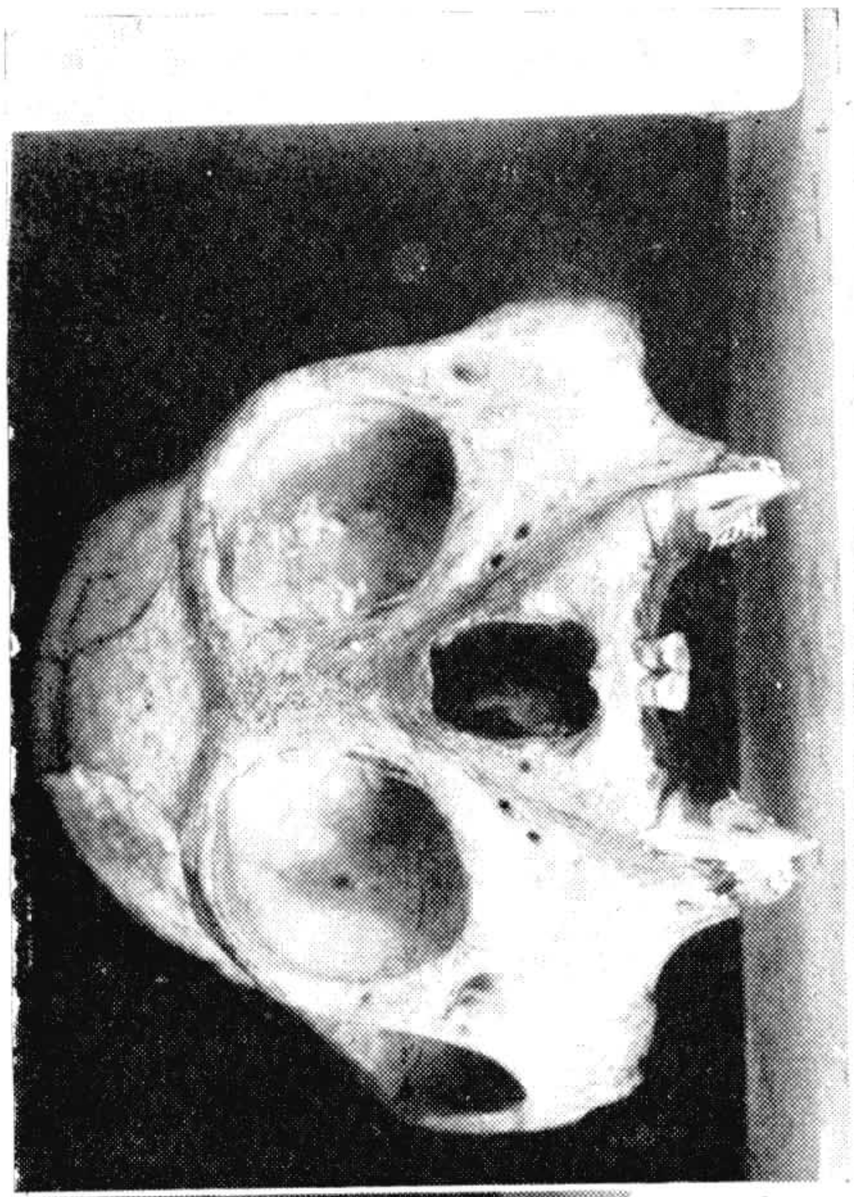
PLATE 17

Figures 1-2 — *Cebus caraya* Humboldt — The skull of the adult male figured in the "Mammiferos da Commissão Rondon, publ. no. 17, est. I, 1914" ,to be compared with figs. 3 and 4.

Figures 3-4 — *Libypithecus marcgravii* Schlosser, as figured by Abel in Weber's Saugethiere, 2the Aufl., figs. 572-A & 572-B. Photos by A. L. de Carvalho.



2

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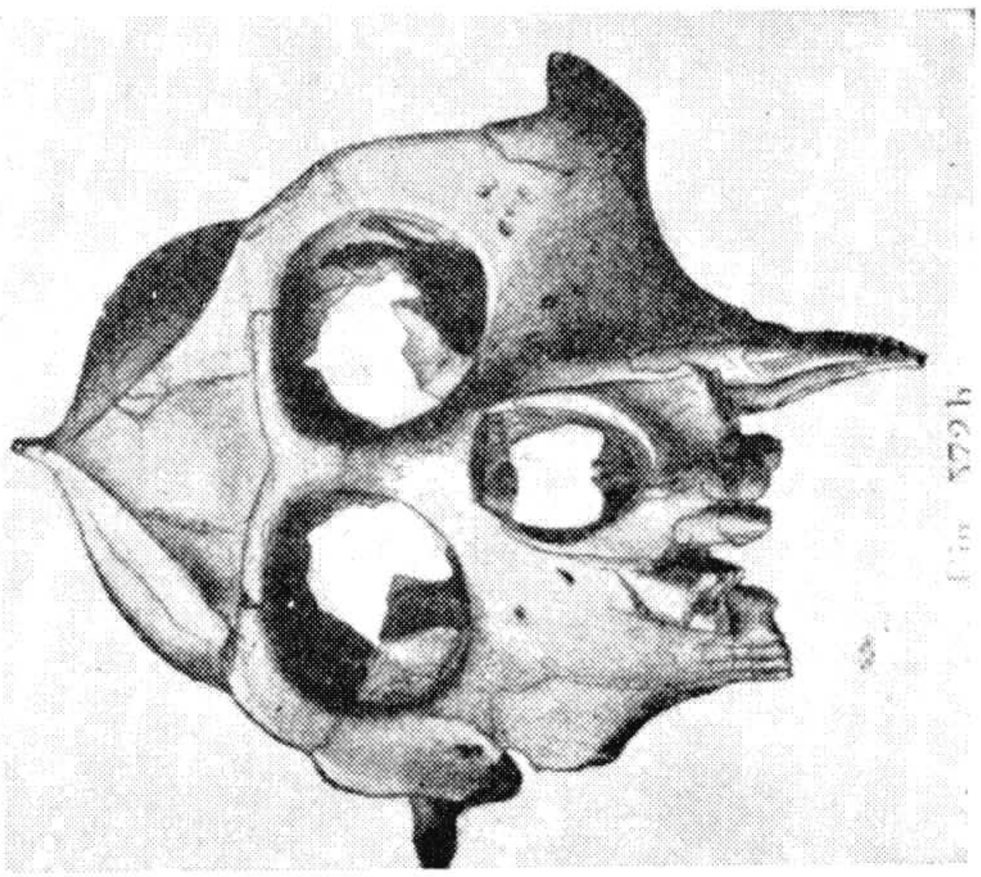

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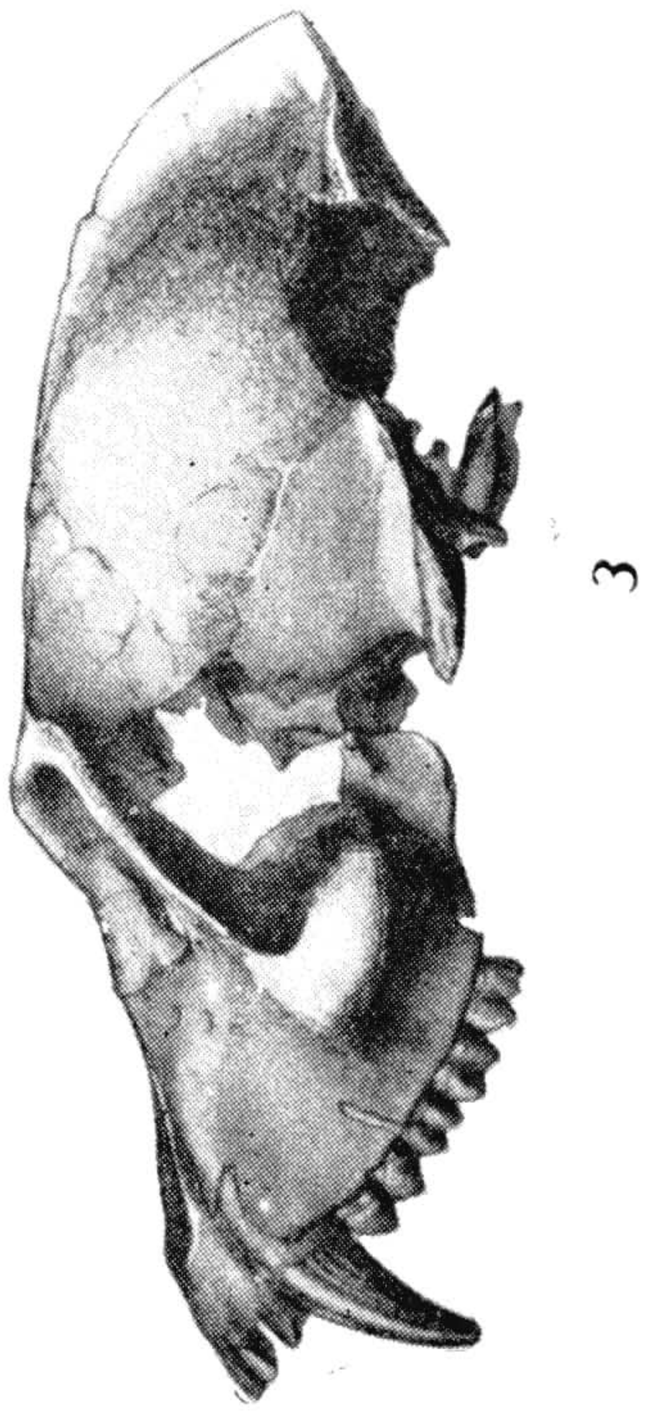

3

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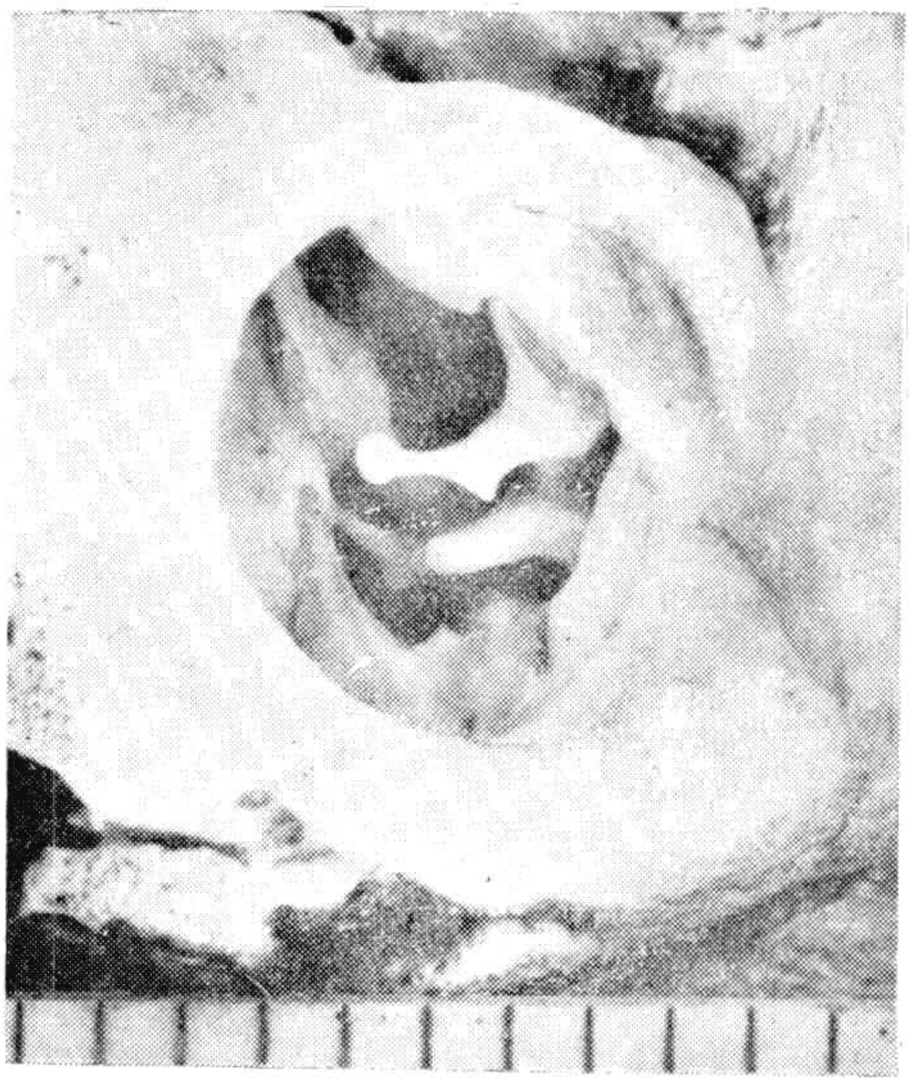
PLATE 18

Figure 1 — Foetus of *Cebus fuscus,* (early stage) showing the orthognatous shape of the head of some Old-World-Monkeys. Greatly magnified. Photo by the author.

Figure 2 — *Ossicula auditus* of the milking *Brachyteles,* figured in the plate 16, to show the clear disposition of the *stapes* on the *fenetra ovalis*. The *lenticulare* is clearly seen on this small bone. The scale under this figure referents millimeters. Photo by A. L. de Carvalho.

1



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