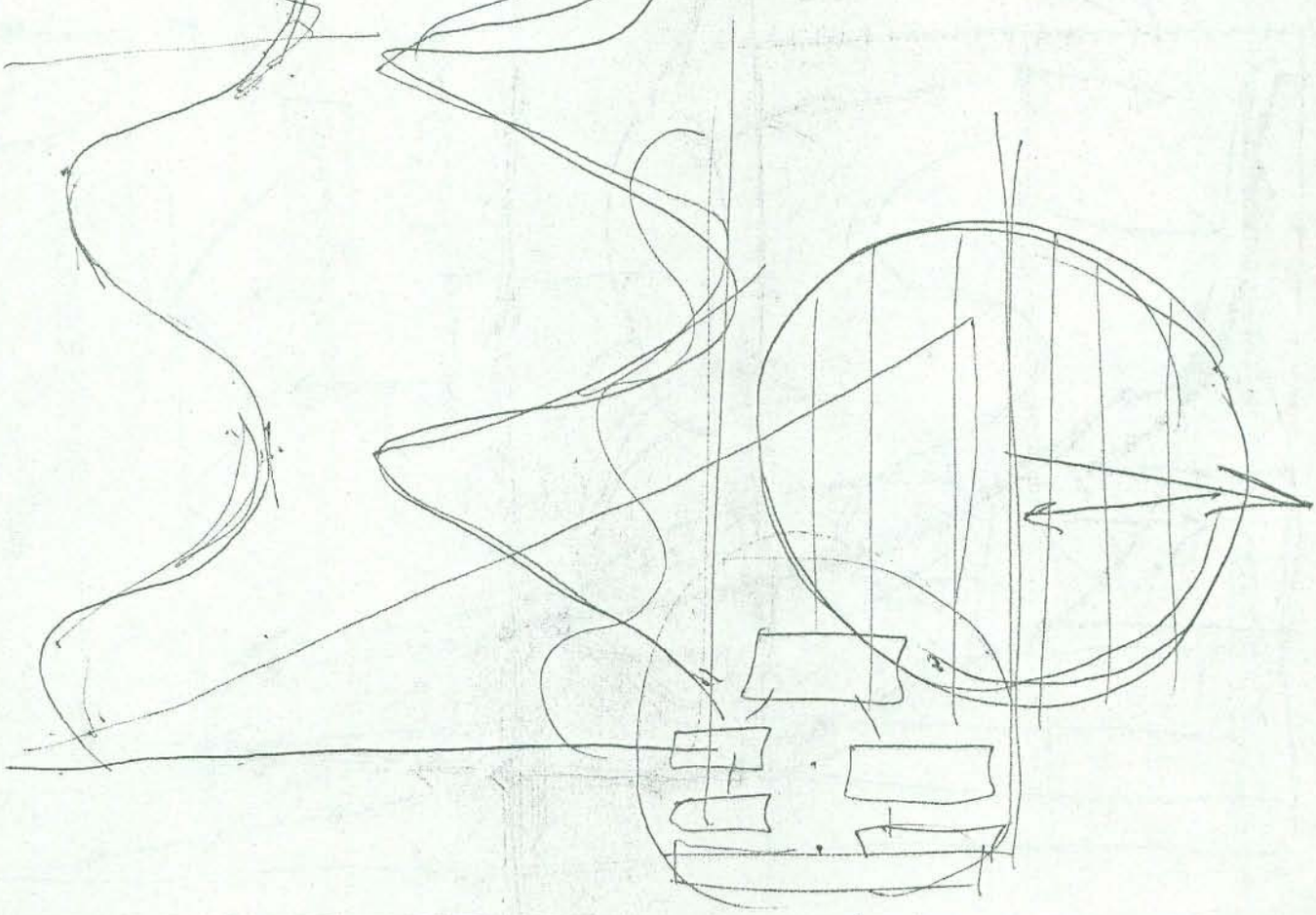
The task was unquestionably dificult, since any of the man ancestors has managed to survive. And it is interesting to consider the condition of survival of this prehominoides.

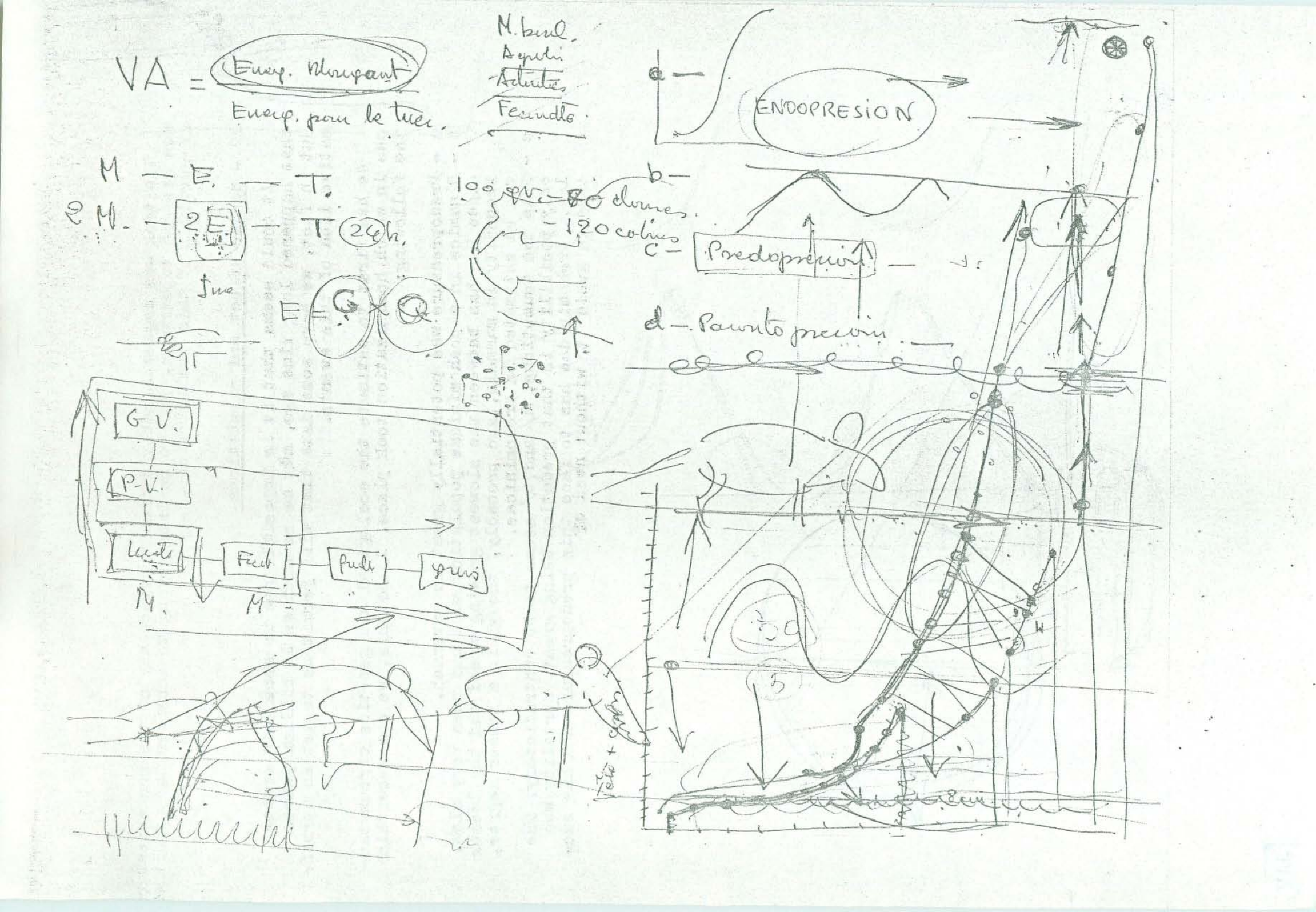
12 - Border effect and populations

It could seems that it is imposible now to ascertain events that happened long time ago, may be so much as 10 million years. But in fact, we have some data that will permit us to get an aproximative idea of this events.

We has first to estimate the ecological and genetics circonstances in which hominization took place. To do this, we can ascertain the following:

a - Predopreasure was potentially great in savannah.
b - Dinamics in a prehominidae population must had been very slow, since Man has between the slowest growing speed and the lesser fecundity in mammals, and probably, though in a lesser degree, can be estimated in prehominidae.
c - This two asumptions, a/ and b/ seems to be contradictory. The only posibility is that predation being great, mortality was low. Prehominidae has to face this predopreasure and has succeed in avoid it, without need of




VA = Energ. Nourrissant
Energ. pour le tuer.
M. brut.
Aspects
Actuates
Fecondes.
ENDOPRESION
M — E. — T.
2 M. — 2 E — T 24h.
E = G × Q
100 gr. — 80 chunes.
— 120 colines
b —
c — Predopression
d — Pauvrete
G V.
P.V.
Fecub
Pulb
M.
M

Another interesting question to be considered is the socila estructure of the populations of prehominidae. We can ascertain it by knowing that the social estructures of living primates are the following:

Also, we know that in the more primitive hominidae, Sinanthropus and Pithecanthropus, there was great differences in size between males and femelles, much more acentuated that in actual man. Great males suggest a social estrcuture in familly parties or groups with more femelles that males. If it was so, thus, and since the sex-ratio at birdth is 50 % males and femelles, we must admite that competence between males, leading to selection, has existed, as in many animals. Male's competition, in mammals, lead usually to: the evolving of:

a - weapons for fight between them, generaly great canines. But as we will see afther, development of canines is a way that do not leads in the hominidae way.
b - imposing aditaments and attitudes. This is the reason posibly for human beard and moustache.
c - in Man only, another factor that begin to has an importance in the Hearth's history: intelligence.

The males excluded from groups or families, has probably to suport the greatest predation and mortality, and were submited to a great sellection. This only can explain the rapid evolution of the hominidae familly, but I beleive, based in ecological reasons that would be explained in other place, that usually , sellection is much stronger in males that in femelles, and that this is a general law, in mammals.

From the exposed asumptions we can infer the genetical conditions of the populations of prehominidae as follows.

i - Lineal dispersion under the border's effect --- genetical isolation.
ii - Great male's sellection ------ fast evolution.
iii - Long living dominant males ------ great transmision of selected genes

No. No copulen who lo σ α

This implies, trought males sellection, an escarce importance of the "drift" effect of Sewall Wright . The local groups were probably excedeengly adapted to local, ecological conditions, and this saposed fact, sombinated with the genetic isolation, let us supose that speciation was great, leading to a multiplication of subespecies ores

Sewall Wright

especies. We know too few remains of primitive hominides to verify this asumption, but the poor representation of the Australopithecidae familly that we know, so widely differents, seems to confirm this suggestion.

It is know that living Pongidae, evolving under circonstances less extreme, has a hight intraespecifical variation of morphological characters. The variability of the number of lumbar vertebrae gets a 43 % in Anthropoids, and the variation in lenght of the extremities is also great. In Man, the variability of the same vertebrae is only of a 10 %.

But the actual uniformity of biotypes in living man is not a base to exclude the polyphiletic origin of hominides that the ecological bases exposed before let us supose. In the last stages of his evolution, it seems probable - by only taken account of the historic events in Man - that the sellection of groups and the interbreeding has been very importants.

17 - Modifications and evollution of the porsterior part of the skull

We has seen that modifications of the face or splachnocraneum are ecologically conditioned by food. An atractive theory explain also ecologically the evolution of the posterior part of the cranium.

Since 1922, Perez, it seems, call atention on the vestibien axe, and it was inmediately followed by Girard, that in 1923 published the first study on the use of the vestibular plane for orientation of the head. Recently, Delattre and Fenart has demostrated his important paper in the modifications of the skull. They has demostrated that the line that unit the centers of the cercles circonscrits by the horizontal semicircular chanels of the internal ear (Vestibian axe) is the center of rotation of the occipital bones. It is contained in the

This theory supose that the skull is organized by raport to the vestibular plane, determinated by the semicircular h

Delattre's theory

Delattre (Les processus de l'hominisation, C.N.R.S.,1958,p. 37-55) has show the importance of the internal ear on the evolution of the posterior part of the skull. His thesis is that the axe defined by the line that unit the center of the cercles circonscrites by the horizontal semicirculars chanels (vestibien axe) is the center of rotation of the occipital bones. The animal tends to keep his equilibrium with rapport to the ground level, determinated in the skull by the horizontal semicircular chanels, that determinate a plane, the vestibular, in which the vestibien axe is contained.

During the evolution of the primates, the plane determined by insercion of the vertebral column in the head, that we can trace by the plane of the foramen magnum, is evolving from a nearly vertical primitive position (Insectivora) to an horiezontal one (Man) passing throught intermediate stades adopted by the simia (fig. .).

This evolution is followed by transformation in the posteriorpart of the skull. The temporal bone, containing the static system,(1) remains in the same position, at the same time that the occipital bone descend and become horizontal. Thus the paleooccipital separates himself from the parietals, leaving an hiatus . This hiatus is thus fill by a new bone, the neo-occipital, of membranous origin, what appears to fill the haiatus in the now open suture of the vault of the skull. At middel hight in the parieto-occipital suture, an small region keep his old conection. The parietal bones must extend forward and down to keep this conexion,so weal as to help in filling the hiatus of the vault.

At the lateral, inferior region of the suture, appear also an hiatus, lesser in size that this of the vault.

"En résumé, au cours du developpment evolutif du brane qui l'ammène à la forme humaine, la rotation du paleo-occipital de l'ordre de 90º determine une breche virtuelle ou hiatus entre l'occipital (paleo-ccipital) et les parietaux.

Sur chaque hemicrane, cette brèche est divisé en deux hiatus secondaires par un pont oseux aux niveau des angles asteriques de l'occipital et du parietal correspondant.

L'hiatus superieur est comblé à mesure de sa formation par l'occipital d'origine membraneuse et par l'etallement des parietaux.

L'hiatus interieur est ferme par l'exteriorization, la rotation et l'extension des lames mastoidienes droite et gauche.

Un volume nouveau est ainsi crée; il depend pour une part de la rotation occipitale. mesurée par la rotation de l'inion (angle iniaque) , et pour une autre part de l'elargissement de l'ecaille occipitale, mesuré par l'ecartement des deux asterions. Cet elargissement est en rapport avec le volume acru des hémisfères. L'examen des cranes d'Anthropoides montre des images de transition evolutive" (p. 44)

(1) see opposite

Delattre conclut that " il y a un ensemble vertébral maxillaire par rapport auquel le crâne s'organise, il ne s'organise pas par rapport à l'ensemble.

The food in the past

We can approach to the food in early men or premen by 4 differents ways, with wide different values.

- Direct knowledge of prehistoric men ~~and anthropice prehominid~~ide.
- Origin of ~~actual food~~ prehistoric men food.
- Incomplete evidence from Pithecantropidea et Australopithecina.
- By eliminating in actual food those ~~objetsnees~~ no vailable for preintelligent men.

Other ways to approach the problem are: the study of tools, the study of theet and this of the posibilities offered by the biocoenoses where prehominides lived. But all this are left for posterior chapters.

Basic food - cereals and leguminoses (bibliografia)

Basic food - Vavilof estudies on the origin of cultivated plants

Basic food - game and "cueillette"

Actual

10 000 años Palafitos - old civilizations

40 000 años - Mustierienseiye

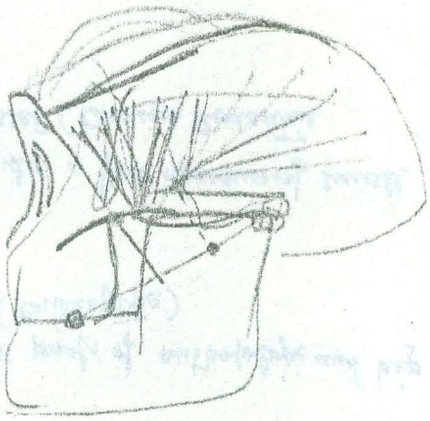
Basic food - Unknow - Only proofs of antropologic and big game knowns (Bibliografia)

Plest inf y medio - Pithecanthropus.

Basic food - Unknow Only a few remains of small vertebrate knows or supposed (Anura Rodentia

600 años - Australopithecidae.

Fig. p. 2154 - Crines quila, pterentypus, europeo.



The tools

We are only interesed in tools as an index of the first steps in the hominization way. Thus we has to consider only a few things.

a - Land living Baboons have be seen using a stone to kill and open scorpios.

Copier la frase completa - Copier cómo utilizan las piedras

b - First tool in man. - Pebble culture.

A. gminivorus eater, throwing pebbles from a distance. leaving it unmodified. He has use it to smash nuts, to smash seeds etc. Along years and years.

By use, the stones broken. It was at the same time that he start knowing. He use the broken stones for cutting meies, then become greater with the involvement of intelligence.

He arrived at the same time to the rifacial and to the big game.

To explain now the evolution of the teeth, it is necesary to accept first two reasonable conditions:

i - It seems logic that the size of a teeth is in direct raport with his use. The more used, become greaters. Thus this enables us to estimate where the resistence point is situated in a molar series, by considering what is the greater molar.

ii - The size of the teeth can be estimated by his length. This is not alwais exact, because the molariform surface is a product of the lenght by the larger , but is more easy and practical to estimate only the lenght. Hurzeler has do so, in his well known paper on Oreopithecus, and we can so doing proffit from his figures.

This accepted, it is purpose to see the variations of the resistence point in some dental series. As result from the formulae of the 3 order mandibular lever, the sorther the resistence arm (thus the more postward the greater teeth), the more powerfull the mandibular arch, and that let us that the more granivorous is his posesor. As a result we can infere the seeds eater nature of an Simia by knowing the position of the larger molariforme teeth. If are exacts, it is to be expected in the granivorous an molar series increasing in size. Hurzeler has do this work.

In this assumptions, we are in condition to examine, for example, the graphic of the relative size of teeth, of Hurzeler (1958, Oreopithecus bambolii Gervais. A preliminary Report., Verh. Naturf. Ges. Basel. Vol 69, nº 1, p. 38-39) of the low mandibula, in a new light.

As seen before, in the dental series we has to consider two different resistence points: The canines, conected with the temporal muscle, and the rapidity of the bit, and the molars, conected with the maseteric muscle and the power of trituration. But this does not means that the evolving of canines supose always a defensive evolution,(since canines are widely used by frugivorous animals to eat),nor that molarization forcidly implies a granivorous regime.

The examination lent us to separe the two groups, apes and hominidae by the usually admited character of the molarization of the P_2, that indicates a more granivorous regime, the molarizated total surface becomes greater.

In Pongidae, we see that M_3 is greater that M_2 in the more terrestrial especes. Hylobates and Pongo, arboricolal, has it small.In Gorilla, Dryopithecus and Theropithecus, is much greater. Since Pliopithecus, that we has add to the Hurzeler's graphic, has a greater M_3 , it could seems that he was a more terrestrial ape that living Hylobates,

In the hominid group, there are two different trends. The more primitive, Oreopithecus and Paranthropus, has all the teeth encreasing in size from J_2 to M_3. The resistence point is thus going postward during this evolutive period. They become more and more granivorous and terrestrial thus, if this theory

is correct.

But the Australopithecidae become intelligent. They change regime as stated before; They use fire and tools to soften the seeds, and start to eat meal, much more soft also. Thus the resistence point is coming forward, at the same time that the molar series is contracted and reducted. The greater molar, M_3 in Paranthropus, become M_2 in Sinanthropus and M_1 in Homo.

At the same time, the relative size of incisives and canines increase. This could be a consecuence of the evolving of language or not, and it is out of my purpose to study it.

In the fig. we has reasumed conventionally the evolution of the dental series in man. The drift of the resistence point as a result of cerebralization and change of regimen is notorious.

(place for the fig.)

B~~etween~~ In the terrestrial Cynocephaloids, ~~the~~ weight is also as a rule gretaer that ~~between~~ in the tree living Monkeys. Some Baboons, Gelada etc are gigantisc animals, We can then supose that there is a treshold in size for arboreal primates, and that this treshold, - in attempt of precisions - can be estimated at about 6 kg.

The first Kenyan land living hominidae , the Australopithecidae, weighed seem to has between 22 and 27 kg, and inhabited countries far away from the ecuatorial forest. I do no know yet if Oreopithecus was or not arboreal, but, being in Eurppe, he can not have evolved brachiation, if our suposition is correct.

The ecological conditions of brachiation

We can conceive that brachiation has been evolved by apes, surpasing the ~~treshold~~ limiting size and inhabiting in ecuatorial forest. The animal brachiating (fig.) pass from a branch to another, or run along the ~~li~~ lianes, hanging from the hand. This supose several modifications in the hand that are of interest, ~~as previously explained~~, since they determine the lost of the precision grip (see fig.). Explain Napier (EXPLAIN IT.).

But the animal resting arboricolal trought brachiation scape from his predat~~a~~ors easily. He does not need evolve great canines for defence, and this, we will se afther, can be one of the more important evolutive factors, aproaching his skull morphology to these of Man.

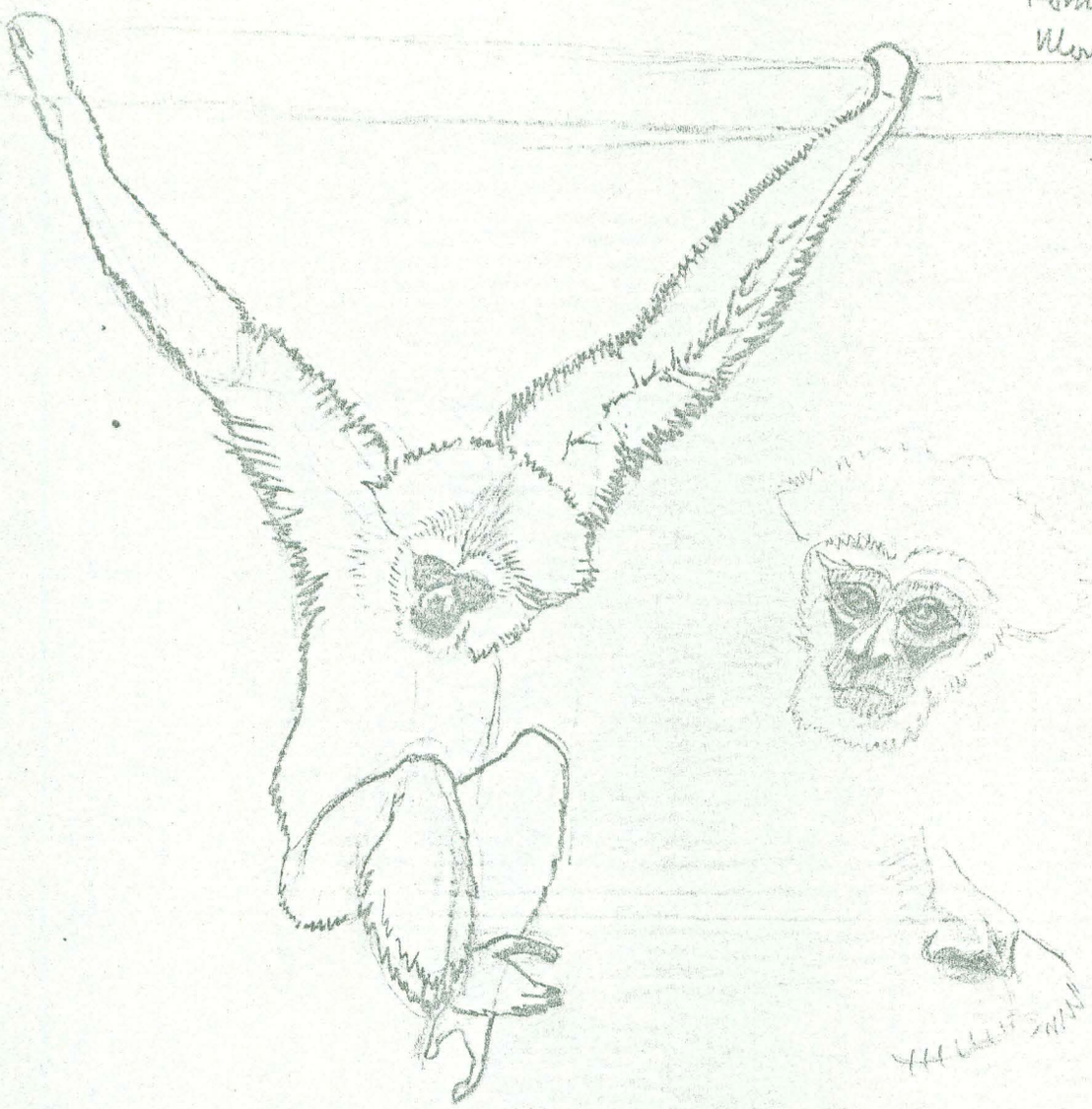
Neverteless, brachiation is only a solution of circonstances, that enables medium weighed animal to remain arboricolal, but that ~~has~~ seems to has also a limit. The heaviest buildt Chimpanzees and Gorilles are largely terrestrial, and this is very noticeable in the old males. Heavy male Gorillas rarely climb to the trees, and it is well know that they stay ~~at night~~ at the very foot of the tree were the familly sleep. ~~pond the night.~~ In the yet more heavy Mountain Gorille (G. g. beringei) arboricolism is so rare taht the foot has evolved in a Man-like manner, lossing partly the prehensibility of the tumb. All this terrestrial old males evolve impresive canines, and we will see afther that this made him separe of the cerebralizated medium-type of Simioidea. Thus the encresing in size of the philum will lend the actual brachiants again to the land, the treshold of brachiation being surpased. This treshold can be up of 12 kg (Symphalangus) . And

When does the Hominidae become terrestrial ? ~~Before the Hominidae become terrestrial~~ . Many things in our organization seems indicate that we descendt from brachiant apes. But our precision grip states that we are ecologically nearer of the land living Monkeys from wich we are well separate in the structure of the molars. The Simioidea preceding Man has had to pass ~~two-t~~ one or two ~~treshold~~ size tresholds, and I am prone to think that Man separated from Antrhopomorfes in the first.

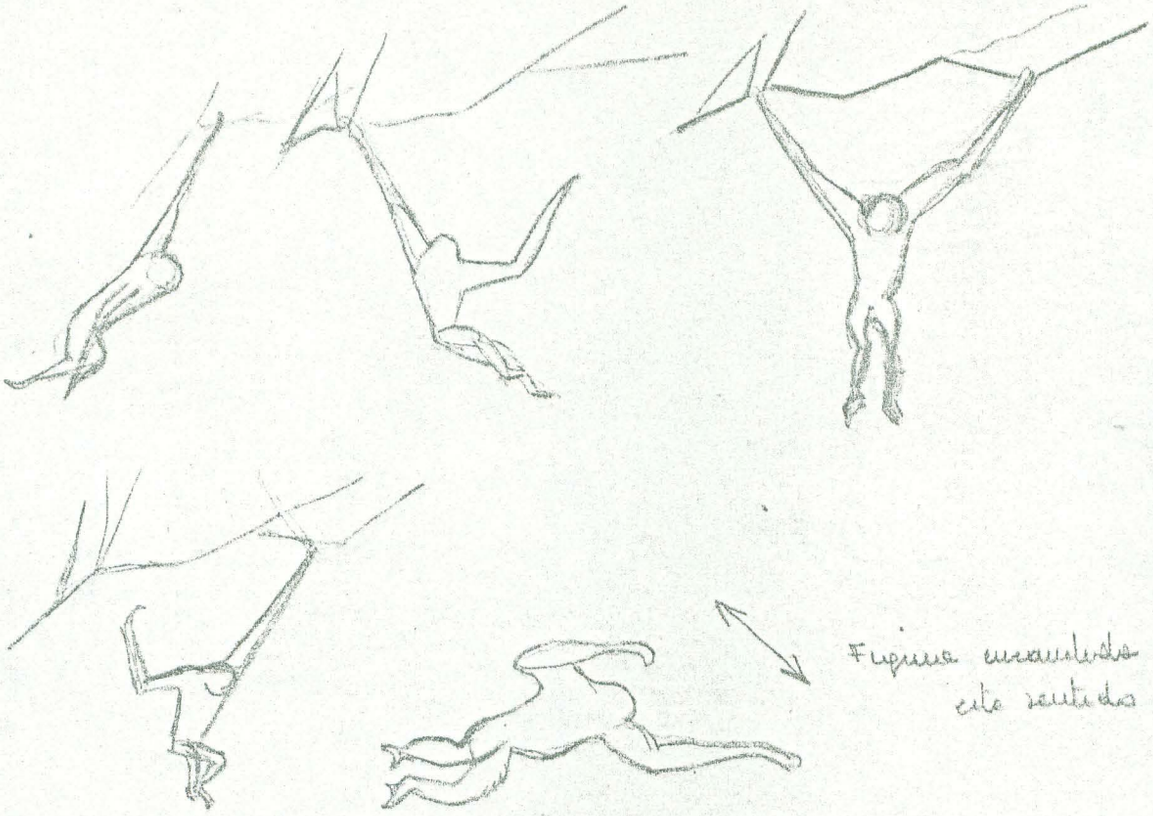
The keys on the origin of man.

Rome. 1948.
Men and the Vertebrates.

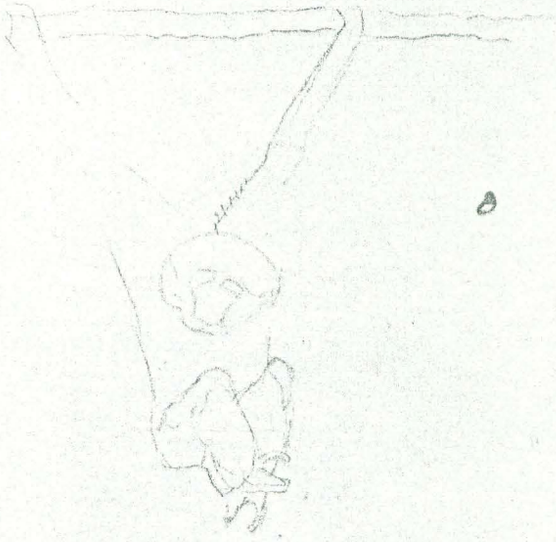
57-4
175



Hylobates moloch,
andonedo (from Photograph)



Reproduction, of gibbon. from Photographs ~~of the~~ from American Primate Expedition,



Prof. hecho por Richardson en alemán el lunes a hace algo en inglés. [21-96]

Work

specialist
catch, caught (past)
fruit
species, speciation
arboreal
has - have (pl.) we have, I have
ways
objects
sketch
incisors
morphology
stomach
female
often
edible
phylum - phylogeny
author
acquire
predator pressure
base - basis
(folifagous) - leaf-eating
transladate - transform - transport.
weight, height
hominids
length
this (sing) - these (pl.)
axis
report - in relation to
vestibular - vestibular
paragraph - section

exist - require
oclusion - closing
Quadrupedal

~~Selection of the demand some explanation to be clear~~

a b c

Shoshones

Je dois ajouter deux mots sur la connaissance et l'imagination

"Si la connaissance nous manque pour construire une vision cohérent et satisfaisant d'un problème, on demandera à l'imagination de nous fournir d'une explication mythique" dit Huxley. (Roe y Simpson. 1958: 453).

Ici, je ne crois pas que la connaissance manque. Tous les faits que j'ai exposé ont été trouvés par d'autres. L'imagination n'a fait que mettre ces faits coté à coté, et dessiner les liens qui les unissent.

By comparing food of Man with those of Primates, it comes result that the main difference is Man capacity to eat grains. The morphological adaptations necessary for this kind of food, a pincer grip and a milling apparatus, being more developed in it that any other Primates. could

~~For~~ From this, it result that Man ~~could~~ has evolved as a seed-eater during the stage prior to cerebralization. The ecological background of ~~this new~~ animal having this diet is discussed in connexion with those of other Primates.

It is found that the change in diet from ~~green~~ frugivorous ~~diet~~, supposed the ancestral, to granivorous and ~~probably~~ later to omnivorous diet, must determine changes in the mandibular and ~~that~~ this changes ~~can~~ be observed in the known fossils. Also, it is possible ~~seem~~ that this changes could had an importance in the evolution of human skull and cerebralization.

Acknowledge –

I thank Prof. Melander and Peter de Bonardos by encouraging me to finish this paper. Rdo P. Aguirre, S.J., Prof. Bourliere, and has helped in the discussion of data, and in the critical lecture of this ~~paper~~ manuscript, ~~whose~~

- Conclusions

According to the exposed reasoning and data, it seems posible that some especies of ~~xxxxxxxxx~~ Primates were obliged to become terr terrestrial, probably as a result of the encreasing size of the philum, and that they found inmediately a biotope, the savannah, where the leguminosas and gramines abounded, providing the new terrestrial animals with a new concentrated food, the seeds. they changed their diet, becoming granivorous.

To take it, the prehominidae will then need to evolve a precision grip, that was the hand. This excluded the posibility of use it in locomotion, and so the prehominidae adquired verticallity. So doing, the cervical column pull the occipital bone to gyre around the vestibian axe, and the volume of the cerebrum was encreased, at the same time that the sphenoidal angle was close.

Seeds being hard, small piedes, the prehominidae has need to evolve a trituring apparatus by multipliing the number of cuspids of the molars. To mill the seeds, the jaw adquired a rotatory motion, which excluded the existence of canines and diastemas.

To encrease the power of the mandibular lever, they would use by preference the last molars in the dental series, what then become the greatest. Simultaneously, the power of the lever was encreased by modifications of the face, that adquired an human shape, with strong frontal torus. Posibly that result in molars becoming hipsodont, and the palate excavate. The maxilar borders took a semicircular shape and entered under the skull. All that could has result in a motion of the face downwards and postwards, enccreasing posibly the oclusion of the sphenoidal angle.

A terrestrial animal, without claws or canines, must had been completely unable to defend himself against predators. But prehominidaecould has scape predation by spending but little time in land, since they get a food with a great amount of energy (calories) Most of his time was then expended in the security of the trees or rocks, thus disposing of a great quantity of free time that implied the use of observation capacities. Also, they were obliged to live in the proximity of refuges, being thus unable to occupy the treeless plains. They must then has lived in the borders of biotopes, in small, isolated populations, and in this conditions of trasmition of genes, could had lead to a rapid evolution, posibly originating very different populations or/and especies.

It seems to be verified that when prehominidae arrived to the Australepithecidae stage, they start to use tools, probably for smashing grains. Intelligence was evolved by this time, and permit them to take small animals, thus changing his diet for a more soft food.

The change of diet seems to be at the origin of the losing of the characteristic of a granivorous diet, manifested in the reduction of the number of cuspids in the molar teeth and in morfological changes in the mandibular lever, that enters also in regression. It seems posible that this reduction postwards of the splachnocraneum further encrease the occlusion of the sphenoidal angle.

When evolving weapons, Men were ables to defend himselves against the great cats, Thusm they do not need to be restricted to the borders of the biotopes, and they could spread all over the world.

Summary

By compearing the food in Man and others Primates, it seems to result that the basic diference is that Man has evolved as a granivorous animal. The morfological adaptations that would impli this diet, are thus studied. It result that all this adaptations are found in hominides, [illegible]

This modifications affect to the hand, teeth and face.

Aknowledge

I thank Prof. B. Melendez and R.P. Aguirre, S.J., by the help they has give me in the consult of litterature and discusion of ideas, and to...
for the critical lecture of the manuscript and complementary data.

Instituto de Aclimatacion de Almería.
Consejo Superior de Investigaciones Científicas.

Almeria y Madrid, Mars 1962.
José A. Valverde.

20 - CONCLUSIONS - A feable explanation of Human origin.

CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS
INSTITUTO DE ACLIMATACIÓN DE
ALMERÍA

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a - Land descencing. (pinter, arbericolo, vas obligeet one or several

1 ~~When~~ the filum encreased his size, a generalizated tipes of arboreal and frugivorous primates were obliged to become terrestrail Doing so they, finding a new biotope, the savannah, where fruts were rare, but seeds of leguminosas and grainss abunded. ~~It changed this his diet, becoming granivorous.~~

To do this, he must evolve a prcision grip. Thas was the hand. This excluded the posibility of use the hand in locomotion, and so, the prehominid adquired verticallity.

So doing, the cervical column become vertical, and he dragged the temporal bone to an horizontal postion. The temporal bne, reamined static, since it contained the horizontal channels of the internal ear, and the occipital gyred around the vestibian axe, separating himsef of the vault of the skull, and producing a gasp that was filled by a new bone and a prolongation postwards of the parietals. This give a new volume to the head (Delattre's theory), and partly flexed the basis of the skull. (fig. a)

The new food exiged a change in in teeth. To smash seeds, he must get an united and enlarged ~~surface~~ triturin surface. then, the number of cuspids in the molars encreased. PM2 become also molarizated. A new rotatory motion of the jaw was also necesary, and this was imposible if the canines , entering each one in the diastema of the other, blocked this rotatory motion. Thus canines become incisive like, not surpasing the hight of the other teeth, and distema disapeared, giving an united surface to the dental series. (fig. a)

Seeds being a hard objets, the prehominidae need to encrease the Power of his mandibular arch, that functionates as a lever of 3 order. Thus the face was modified such to as encrease the Force of the maseteric and ~~temporal muscles~~ anterior part of the temporal muscles. The insections of the maseteric become more separated, and so the cygomatic become higher and the angular apophisis of the jaw lower. Also the temporal muscle become longuer vertically, by descending of the coronoides and posibly expansion of the forehaed. (fig.)

At the same time, the Force arm was elongated forwrds. Thus the cononoides separate fron the condyle, ~~becoming towards~~ drifting forwards, ans dragging the cigomatic arch, in which window was contained. Also the maseteric muscle become forwards, pulling

the cygomatic and the angular apophisi of the jaw.

By using the last molars, mechanically more potents, they encreased his size. The Resistence point become postwards, and so do the Resistence plane. The dental archade become semicircular, what leads postwards more teeth ans is mechanically better.

During this procesus, the position of the dental plane by raport to the vestibular plane han probably not changed, keeping the same angle between them, posibly by some ecological reason depending of the catch of food.and/or terrestrial habits. Thus, the general encreasy of size on the mandibular arch, combined with the general postwards motion of the Resistence plane, made the face gyre negatively (fig.)

This gyre has some importants results: ~~First,~~ to get the same dental plane, now down, the posterior molars must descend. The palate thus become excavated, and the molars, posibly, more hipsodonts.

b - The angle formed by the dental and Resietnce plane is closed. The farinx is pushed againts the basilar surface of the occipital, and excavate the base of the skull, This motion, combined with the negative gyre of the face, oclude the sphenoidal angle and flex more get the basis of the skull.

c - The strong jaw, with protuberant angular apophisis, stroke against the neck during this retrogression.

Lips are evolved as a needlt of separate the seed of extrange objets taken by the precison grip. They made a similar effect to the valvulae of the rodents. The same tongue, becomes carneous to operate easily the seeds, small and hards. Thus, the palate excavated, lips and tongue prepare mouth for lenguage. (ver lengua en loros)

All along this procesus, as the dental plane become down, the orbits become greater.

All the force of the maseteric muscle and the condyle is applied against the cygomatic arch. This is fortressed by becoming ticker and the support of the superciliar torus, that become so powerfull. As the canines are small, it does not need of this support, as Gorilla needs.(Zinjanthopus)

In this stage an Australopithecidae skull is get. In some cases, the anterior part of the temporal muscle need also an oseus suplemetary inserction, ans a sagital crest,appear in the forehead (Paranthopus crassidens).(fig.)

The encephale develops in the new volume of the skull. The regions of the cortex correspondig to the lips and hands get a great importance, while the corresponding to foot remain small.

During this time, prehominides has to support a great predopreasure, but they can not evolve canines for defence. They has arrived to spend but little time on ground, where they are exposed to the attacks of great cats, by getting a food that having

a great energetic contents, permit it to expend many ours in the security of the trees or rocks. During this free time, the observation capacities is evolved. The increased energy of the new food is probably then directed towards the growing of the encephale, wich exiges a great expend in energy, and in the new volume of the head, it encrease his volume, may be by mutations leading to encrease the number of mitosis of the nervious celules (theroy of).

This prehominidae are obliged to live near the refuges, profiting of the effect know as "border's", and can not spread over the treeles or rockels plains, owing to predation. They geographical distribution must had been then lineal, dividing the whole especies in numerous populations, rather independing or with scarce genetical relations.

In this poll populations, it is probably that the genes can had trsnamissed rather independently of the biological posibilities, since predation is avoided and food get. This can originate a drifting evolution, under the Sewell Rieght Effect, and numerous especies evolved. but not probably by Right selection of males.

By imitation, some of this populations can start to use tools, waht was, in the early stage, mostly used to smash seeds, being simple pebbles taken in the grevels of the rivers. This fact, simultaneous with the growing of the encephale, leads to a first culture.

It seems to verified that when prehominides arrived to the stage Australopithecidae, they start to use very simple tools, probably usefull only to smash grains, giving origin to the "pebble-culture". Intelligence was evolved by this time, and permit them to take small animals first, juvenille of great animals afther, and big game later This represented a change of diet for a more soft food.

This change od diet seems to be at the very basis of the reduction of all the mandibular arch. The same way, but in contrary sensus, that the granivorous stage has mealizaed, was follow by this hominidae. The reduction of teeth, of number of cuspids, and the advance forwards of the resistence point, at the same time that the familly encreased his size, were the result of this change of diet. The appearance of wise and chin in Homo is sincronicus with this reductions.

It could then seems difficult to explain why, during this late fase of evolution, the occlusion of the sphaneoidal angle encreased, since the resistence plane was coming forward. The posible anser is that this plane does not change his angle with the vestibular plane, the reduction of all the andibular arch being so in nature as to made advance the resistence plane relatively, but not absolutely. (fig.), passing from the 3rd to the 1st molar.

COMPARAR CON CONCLUSIONES.

20- FINAL CONSIDERATIONS

May be, the best control that we can give to a theory is the confront it with the problems that it must help to elucidate.

So thinking, I has turn the last chapter of Piveteau (Traité de Paleontologie, Vol. III, 1957) (p. 699-6) and the pages as an ~~where the problem of hominization~~ as an comp prehensive study where the hominization is summarized in his most important aspects, and made a list of problems and answers that the theory there explained can explain.

1- bipedic original — Necessary
2- Original type —— Not answer, but if deriveted from Pongidae, in an early stage of this line.
3- Relatively tiny canines in Man - Evolved potentially to carnivorous stage, as a result of new diet
4°- per Pm inferior molarized - One of the first adaptations of hominidae, as a ~~result~~ need of grain-eating.
5°- Manches non specialices - Unexact. Hand is very specialized in the precision grip, and foot, in a regression from Simiadae type to terrestrial life.
6- Regression of the teeth - Result, for the canines of frugivorous diet, and for all, from the change to soft food after hominization.
7- terrestrialism - Result of the increasing size of the brain.
8- Liberation of the hand - a Need for the Precision Grip
9- ~~Contradication~~ - theory of debate, Prible lack of defense (cerebrum becoming greater.) strong curling of canines - Free-time. - sensorial centers for fingers (Precision grip) and lips. - Sense of Subjects? -
10 - Reflexion — ?

11 - Angle at the bases of the skull - Rotation of the occipital axis possibly the writing of a face without cau-
dal and inferior lines.

12 - Tonus - Needs of the quadrupeds, not usefull in omnivorous soft eaters.

13 - Occipital torus - Disposes by verticality of the head over the vertebral column.

14 - Brachicephalization - Probably, the yet continued result of the weakness property of Temporal complex, that does no need longer muscle. Spherical form of the head to keep equilibrium (Weidenreich)

15 - Weakness of the skeleton - a just homodar result of the no need of ~~corporal~~ defence against predators replaced by cerebral defence. Probably sexual selection.

16 - Mentum - a result of teeth regression under the change of diet.

17 - Complication of cerebral bark - ?

18 - Teeth evolution - Seen before.

19 - Phyletical structure of human ~~tribe~~ - Numerous, small and well differentiate species prior to hominization, under the border's effect. a few, diversifying slightly, after this, and may be only one continuously evolving, very fast, the more intelligent ~~species~~ or forms living as parents or (1)

20 - Place of Man in Nature - a prey evolved under very special circumstances to become a predator, through evolving of intelligence.

This was with this paper, that I believe it is interesting.

(1) predators on the others, till to extermination.

The fisiognomic aspect of the countries where the gallery forest meet the savannah is well know. Out of the main forest, small groups of trees offer refuge here and there, and many of this are Leguminoses. Bush and tall grass cover the ground.

Where two main biotopes meet, life is very rich, and the abundance of species and individuals is greater than in either of the two biotopes considered separately. This is ecologically knowm as "border effect", and has considerable importance, since many species, unable to occupy either of the biotopes, can only live in this zone. It offers a variety of food, and provides good protection against predators.

In Africa and Asia, this is the principal biotope ~~afordinate by~~ of the great cats, the worst ennemies of the Simioidea. Newertheles, the semiterrestrial Monkeys live here, as for example the Macaca, Papio comatus, Papio cynocephalus, P. doguese, P. papio, Comopithecus hamadriads and Theropithecus gelada. Many of them preffer to the arbored savannah the rocky slopes of mountains that afford also a refuge against predators.

The abondance of edible plants for a granivorous animal must be great, since in a short rewiew of litterature, I has found that have ate almost especies ~~appear that~~ are interesting to man. ~~The list include such genus as~~

~~All this plants are~~ of tropical Africa, tought I do not know his exact biotopes. It ~~seems~~ that there ~~is~~ a posibility of determinate, by the study of the oedible plants eat both by the terrestrial monkeys and the primitive peoples, what was the biotope more alike for the first hominidae to appear, ~~since it seems that the african Rand Flora has not greatly changed since the Miocene~~.

What seems out of any doubt is that a Simia obliged to become terrestrial in tropical Africa or Asia, meet inmediately a biotope where the fruts and leaves soons desapear and are replaced by seeds and roots. This last food has, incidentally, a much more higher calorific power, and woul permit an animal keep the same basal metabolism, activity and fecondity under much more cold climates. Thus, an animal eating concentrate food of this type, can spread out of the equatorial zone, and so do both Cynopithcoids and men. We know that they has in commoun the precision grip and the molarization.

~~VALOR CALO~~