But the most curious statistics are those relating to the nasal indices of the tribes examined. They corroborate the high value of this physical element in racial anatomy. The nasal index is found in India in two widely distinct types; the one platyrhine to a degree closely approaching the negro (88–95), the other leptorhine about in the same proportion as in western Europe (67–72). These indices bear a constant relation to the order of social precedence, to the distinctions of caste, and to the organization of the family. "It may be laid down as a working hypothesis, if not as an absolute law, that the social position of a caste varies inversely as its nasal index." Everywhere the narrow-nosed Brahmin is at the top, the broad-nosed Pariah at the bottom. Wherever there is a high index, — above 80, — we find a low social position and the totemic sub-division of the tribe; wherever the index is low, — below 75, — we are equally sure to meet high rank and an eponymous family system.

Incidentally it may be added that these investigations bear out the ancient Indian traditions that the Aryan nations of India entered the peninsula from the north-west, and destroyed or subjugated the ancestors of the dark, flat-nosed Kols, the "snub-nosed blacks," often referred to in the ancient Vedic war-songs.

OSTEOLOGICAL NOTES.

IN previous papers (*Science*, Vol. xvi., p.332, Vol. xvii., p. 117, Vol. xviii., p. 53) we have assumed that the modifications presented by the jugal arch in the Mammalia are due to the various influences derived from use or disuse, correlated necessarily with the habits and environment of the animal. In no order is the specalization of the arch, under the influences of natural selection, more clearly exhibited than in the Insectivora.

Adopting the classification of the highest authorities, and notably that of Dr. Dobson, this order may be divided into two sub-orders, first, Dermoptera, embracing only one species — Galeopithecus volaus — and, second, Insectivora Vera, which comprehends all the remaining families. This second sub-order may be divided in turn into two groups. In the first, — including the families Tupaidœ, Macroscelidœ, Erinaceidœ, Talpidœ, and Soricidœ, — the true molars have W-shaped crowns. In the second group, including the Centetidœ, Solenodontidœ, Potamogalidœ, and Chrysochloridœ, these same teeth have V-shaped crowns.

Accepting the above classification, the Insectivora, so far as concerns the jugal arch, may be brought into three groups.

1. Those in which the arch is complete and well developed, comprising the Tupaidœ, Macroscelidœ, Rhynchocyonidœ, Galeopithecidœ.

2. Those in which the arch is complete but more or less feebly developed, comprising the Erinaceidœ, Talpidœ, Chrysochloridœ.

3. Those in which the arch is partially or wholly deficient, comprising the Centetidœ, Potamogalidœ, Solenodontidœ, Soricidœ.

The Tupaia (Squirrel-shrew) may be taken as a typical form of the first group. The jugal arch is well developed, a post-orbital process from the frontal meeting a corresponding one from the malar, thus forming a complete bony orbital ring. The malar has a large longitudinal oval vacuity, which, although unique in this case, when taken with similar vacuities in the palate of this genus, as also in some of the other Insectivora, points unmistakably to the Marsupilia. The horizontal curvature of the arch is sufficient to counteract any inherent weakness due to the vertical curvature with its convexity downwards. The temporal fossa is moderately extended, while the coronoid surface of the mandible presents a large backward projecting surface rising high above the transversely produced condyle.

In the second group, where the arch although complete is for the most part weak, the cranium presents marked modifications. In Erinaceus and Gymnura the arch is formed mostly by the processes of the Squamosal and maxilla which join, while the molar is very small and occupies in a splint-like form the outer and under sides of the centre of the arch. There are no traces of any post-orbital processes. The temporal fossa is deep and extended, while additional surface is afforded for the temporal muscle by the prominence of the sagittal and occipital crests. The ascending ramus of the mandible with its broad concave coronoid surface and the development of the pterygoid fossæ denote increased masticatory powers, in spite of the apparent weakness of the buttress.

In the Talpidœ, certainly in all of the truly fossorial of the family, the jugal arch is slender and exhibits no distinct malar bone, no occipital or sagittal crests, and no post-orbital processes. The mandible is long and the vertical portion presenting a moderately extended coronoid surface with a small transverse condyle. The infra-orbital foramen is of great size, being a very slender osseous arch which serves for the transmission of the large infra-orbital branch of the trifacial, which affords the necessary supply of sensory nerves to the muzzle.

In the Chrysochloridœ (Golden moles), which in the general shape of the skull present modifications different from all other Insectivora, the jugal arch is in some species so expanded vertically, that, as Dr. Dobson remarks, "their upper margins rise above the level of the cranium giving additional origin to the large temporal muscles." There is no post-orbital process given off either by the frontal or zygomatic arch. As regards the mandible, the coronoid process is little elevated and in some species is nearly level with the transversely extended condyle.

In the third group the arch is incomplete, and in one instance, at least, may be described as entirely absent. In the Centetidœ, the skull is long and narrow, and marked by largely developed occipital and sagittal crests which serve as attachments for the muscles of temporal origin. The zygomatic processes of the maxilla and squamosal are very short and rudimentary, while the malar is entirely absent. The temporal fossæ are very large, and the skull retains nearly the same width at their anterior and posterior regions. There is not a trace of a post-orbital process. The infra-orbital foramen is circular, and capacious. There are no pterygoid fossæ. The coronoid process of the mandible is largely dedeloped, its inner surface being concave, and its outer surface flattened. The condyle is small and circular, while the glenoid surface is transversely concave.

The other families of this group with the exception of the Soricidœ agree with the Centetidœ in the modifications of the skull that have been described. In the Soricidœ the cranium is broadest just behind the glenoid surfaces. There is no jugal arch and no trace of a post-orbital process. Frequently there is present a strongly marked lambdoidal ridge as well as a sagittal crest. There is no pterygoid fossa, but very large vacuities exist on each side of the basis cranii.

The mandible resembles that of the Talpidœ, although the horizontal ramus is shorter, while the ascending one "pre-

sents a very large and singularly deep excavation upon its internal surface quite characteristic of the genus." The articular surface of the condyle looks backwards instead of upwards. The angle of the jaw is elongated and thin.

The infra-orbital is large and bounded posteriorly by an osseous bar.

It will thus be seen that, in those families of higher forms which compose the first group, the jugal arch presents a typical formation.

In the second group, the slight modifications indicative of weakness, to whatever cause they may be assigned, are amply recompensed by the presence of cranial crests for increased muscular insertion.

More or less disuse, as the result of the loss of masticatory power, which is not needed, has so modified the arch in the last group that it has become much reduced, and in some cases has entirely disappeared. D. D. SLADE.

Cambridge, April, 1892.

ATTEMPTED EXTERMINATION OF THE POCKET GOPHER, GEOMYS BURSARIUS.

THE ravages of the pocket gopher extended very generally throughout the State of Iowa, but came under my own personal notice in the rich and fertile farm lands of Poweshiek County and surroundings. The annual loss they occasioned became a matter of such serious moment to the farmers of this county that on Jan. 8, 1890, an unusually liberal measure was voted by the board of supervisors, to the effect that "a bounty of ten cents a head be paid on gopher scalps taken in Poweshiek County, subject to the same laws and conditions that pertain to the payment of bounties on wolf scalps, and pockets must be produced in each case before the claimant will be entitled to the bounty."

These concealed little pests not only feed on surrounding vegetation, but, what is worse on the whole, choke it out by the innumerable mounds of earth heaped up by them everywhere.

I have seen fields which were literally black with gopher hills, and, if rooting swine can be said to upturn a field, so can the gopher. Besides, the loss by accidents to machinery and animals occasioned by striking against the gopher hills, or by sinking into their runs or holes, is very considerable. So while it is not to be marvelled at that some concerted action should be taken towards the extermination of such a pest, yet the high price paid for the experiment must excite some comment.

Taking into account the liberal bounty offered, the universal prevalence of gophers in countless numbers, and the fact that their capture was attended with but little labor, and only trifling cost, it can readily be seen how trapping by men, as well as boys, was at once tremendously stimulated.

It actually became a lucrative employment, at which the trappers spent their time in whole or in part for practically the entire year. The trapping began as early as February, and continued as late in the fall as December; the result of it all being that the incredible number of 140,000 was trapped and paid for in Poweshiek County during eleven months of the year ending December, 1890. The gopher pockets were taken instead of their scalps, and the price paid for 140,000 pockets by one county amounted to $14,000. As skill comes with experience, and as the great gopher populace of the county was but slightly thinned out, it was my judgment and that of others, that the catch of 1891 would considerably exceed that of 1890; some estimating the number that would be trapped as high as 200,000.

Accordingly the probable price which the county would have to lavish on gopher bounties bade fair to reach proportions that might bankrupt an ordinary county. While these facts were forcibly borne in on all taxpayers, yet the farmers were willingly taxed, even adding to the bounty in many cases to encourage trapping on their own lands, and stoutly defended the measure in opposition to the citizens of towns and villages who very unwillingly submitted to a taxation that seemed to them to discriminate between town and country rodents, believing that it was quite as fair and reasonable to apply the tax to the extermination of town rats as to field gophers.

An attempt to change the law failed, owing to the farmers' support, but in the winter of 1891 a resolution was passed reducing the bounty to five cents and requiring the claimants to present the fore legs instead of the pockets.

As a direct result of the reduced bounty, rather than a result of diminished gophers, the catch for the year ending December, 1891, was but 18,000, and of these no doubt a part was trapped in 1890. Trapping began in April and ended in December.

The gopher is a prolific rodent, and it seems almost absurd to believe that in a county where they probably number millions that their ranks have been noticeably thinned or their ravages diminished. The most sanguine supporters of the gopher bounty allowed not less than five years for their hoped-for extermination.

Taking into account their present numbers, their prolific natures, and underground habits, the attempt to oust them once for all seems almost a ridiculous undertaking. But what renders the present errand particularly bootless is the gopher at large in surrounding counties where no bounty is offered for their capture. The most persistent concerted action on the part of all the counties, while it might check the pestiferous gopher, could scarcely expect to destroy it; much less can an isolated county like Poweshiek, in the very heart of a gopher paradise, expect to reach that unattainable end.

Among the interesting nuts to crack offered the bounty supporters are a few considerations like the following.

As the gophers are thinned out in Poweshiek to the point where trapping is less profitable than in adjoining counties, the elastic consciences which some trappers are said to have will suffer them to trap outside and sell to the more liberal county, in spite of the binding oath which they must take.

But another absurd temptation was placed in the way of the faltering trapper. He could, in Iowa County, present to the county auditor the fore-legs of the gopher he had trapped, and draw his bounty where fore-legs were equivalents of scalps, and by crossing the line he could present the pockets of the self-same abused gopher and draw from the Poweshiek treasury an additional bounty on their pockets, thus making the poor gopher do him double duty. It is a known fact that all have not been slow in rising to their opportunities and drawing double bounty on the unfortunate victims of the trap.

In trapping gophers, it is the common practice to dig down and bury ordinary steel traps in their runs, and to visit these at stated intervals. The traps are not bated.

Among the gophers caught albinos are met with occasionally. During the fall of 1890 there were brought to me several gophers with white pelage — a dirty white — looking like a winter coat.

If albinos, their eyes were not pink, which suggested the possibility of an overlooked variety. From Mr. F. W. Porter,