The appearance and consequent value of the fibre depends mainly upon the care taken in drying it, as should it be exposed to rain and not completely dried, it becomes discolored, assumes a brownish tint, and loses its strength to a considerable extent. The outside layer produces a reddish-colored fibre, which is quite sound, and easily distinguishable from spoiled hemp, but fetches a lower price in the market.

The cost of preparing and planting a *quinon* (about seven acres), and keeping it clean up to the time of the first crop, is estimated at from two to three hundred dollars, not including the first cost of the land; and afterwards an annual outlay of about sixty dollars would be required to keep the soil free from weeds, etc. The extent of land mentioned, after the plantation is three years old, would produce from sixteen to twenty bales per annum, according to the quality of the soil.

Almost without exception, landowners who devote themselves to the production of hemp in the Philippine Islands are European Spaniards, or natives of the islands, and a foreigner would have considerable difficulty in establishing himself, and would meet with many obstacles before he found himself in touch with his surroundings. Foreigners can only own land in the Philippine Islands under the following conditions, which are strictly enforced: (1) That they reside in the Philippine Islands, and are duly registered in the books of their respective consulates and of the government. (2) That their lands be sold, should they leave the islands and establish their domicile elsewhere. (3) That, in the event of the death of a landed proprietor, his heirs be compelled to reside within the territory of the Philippine Islands, or sell the property. The acquisition of land by foreign companies or associations is absolutely prohibited.

The cost of native labor is about twenty or twenty-five cents a day; but the principle upon which the hemp plantations are worked is, that the laborer gets one half of the result of his work, the other half going to the proprietor. A laborer, under pressure, can clean about twenty pounds of hemp per day; but, as a rule, the quantity cleaned by one man, working steadily day by day, averages about twelve pounds. Many unsuccessful attempts have been made to improve upon the primitive knife and board, which are, up to the present, the only means used for cleaning the fibre. The great faults of the new inventions have been the weight of the machine, and the additional liability to break the fibre. A necessary requirement for any new machine which would replace the present method is, that it should be light enough to be easily carried about by the workmen from place to place on the plantation. The exports of hemp from the Philippine Islands, in 1890, amounted to 63,270 tons, which, at the average price for the year, realized about ten and a half million dollars.

THE ELECTROLYSIS OF ANIMAL TISSUES.

THE first number of "Studies from a Physiological Laboratory, Owen's College, Manchester," contains a paper by G. N. Stewart, which is an interesting contribution to our limited knowledge of the action of electricity in relation to animal tissues. From an abstract of this paper, which we find in a recent number of the London *Electrical Review*, it seems that practically the whole of the conduction in animal tissues is electrolytic, and the electrolytes are principally the mineral salts, changes in the proteids being produced by secondary electrolytic actions.

In simple proteid solutions, conduction occurs with great difficulty if mineral salts are absent, or if they are present only in small proportions. The effects on the proteids themselves in saline solutions vary somewhat with the current density. Alkali-albumin is formed at the cathode, and acid-albumin at the anode; while in solutions of coagulable proteids there is also coagulation at the latter pole. With a strong current, the proportion of coagulated proteid to acid-albumin is greater than with a weak current. In bile and urine it was observed that the conduction is also chiefly due to electrolysis in the mineral substances, and not in the organic substances contained in these secretions. In blood, the changes which take place in the proteids are similar to those which are mentioned above. There is also a formation of acid-hæmatine (mixed with or preceded by methæmoglobine with certain strengths of current) and of alkali-hæmatine at the anode and cathode, respectively. There is no evidence that hæmoglobine or any of its derivatives can act as an ion.

In muscle the nuclei become apparent and the sarcous substance granular at the anode; this is the appearance always produced by a weak acid. At the cathode the fibres become more homogeneous. The chief chemical changes in proteids are, an increase in the neutralization precipitate of the aqueous extract, and a corresponding decrease of the globuline. At the anode the neutralization precipitate is increased, but the amount of globuline is more than correspondingly diminished, because part of this proteid is coagulated. The effects of electrolysis on the salts of the muscles were studied by estimating the ash. Striking changes were found to occur, which, if produced within the living body, would profoundly modify nutrition. The antiseptic action of the current was studied in the case of micro-organisms, and it was found to occur chiefly, if not entirely, around the anode.

In another and later paper specially devoted to the electrolysis and putrefaction of bile, Mr Stewart shows that when bile is electrolyzed in a U tube, changes take place at the negative pole, which are similar to those which occur when bile is allowed to putrefy; that is, the pigment changes to brown through light shades, ultimately becoming yellow. In the early stages of the electrolysis a reversal of the current restores the original color. The anode has an oxidizing, the cathode a reducing, action upon bile. The bile salts are electrolytes, and an acid constituent of these crystallizes at the anode in long needles; but the conductivity of bile salts is small as compared with that of the inorganic constituents of the secretion.

With these results for bile we may compare those obtained by J. B. Haycraft and H. Scofield (Zeit. Physiol. Chem., xiv., 193). In the course of their researches they showed that a play of colors is obtained at the positive pole of a battery (four Grove cells) placed in the bile, indicating successive stages of oxidization: if the negative pole be then placed in the bile, the effects are reversed, indicating reduction.

Mr. Stewart makes some attempt to connect this knowledge of the electrolysis of animal tissues with the application of electrolysis in surgery, and promises a further communication on the physiological aspects of the question.

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Osteological Notes.

IN my notes published in *Science*, Vol XVI., p. 332, upon the significance of the jugal arch, I stated that although this arch is often composed of three bones, this number was sometimes reduced to two, and in some cases rendered still more rudimentary, but that in no case could the arch be said to be absolutely wanting. Moreover, that the number of bones present, as well as the strength of the arch, depended upon the extent of surface, and upon the amount and form of curvature, and these, in turn, upon the advanced or receded position of the orbit, as also upon that of the articulation of the mandible, whether above, below, or upon a level with the orbital cavity. These also are correlated with the extent of surface presented by the ascending process of the lower jaw with the adjoining crests, processes, fossæ, with the dental series, and necessarily with the muscles of mastication.

I cited the *Carnivora* as presenting the most instructive example of the various points to be considered in connection with the morphology of the arch, every one of these having reference to enormous development and implying great strength and capacity.

I also cited certain of the *Edentata* as exhibiting the exactly opposite condition, —a rudimentary and incomplete arch, with consequent feeble muscular power, no necessity for mastication, and an entire absence of teeth.

In the crania of the *Primates*, the jugal arch is composed of two bones, the zygomatic process of the squamosal, and the malar; which last, resting upon and articulating with the maxilla, is joined with the squamosal process by a serrated suture which inclines downwards and backwards, the amount of the inclination being modified in the various groups of this order. The strength and curvature of the arch also widely vary, as also does the extent to which the various crests and ridges for muscular attachment are developed. In man, the arch is generally slender, slightly curved in its horizontal axis, and presents a very moderate convexity upwards in its vertical curvature. Owing to the very slight horizontal curvature outwards, the temporal fossa is relatively shallow, consequently allowing but little development of the temporal muscle This condition, however, is subject to modifications in the various races of man. The maximum breadth of the cranium is at the jugal arches, and it is at these points that craniologists now take the bi zygomatic diameter of the face.

Humphrey, in his "Human Skeleton," in speaking of this arch, says: "The upper surface of its root forms a smooth channel for play of the temporal muscle. In the negro the greater width of this channel throws out the zygoma into stronger relief, and, added to the flatness of the squamosal portion, affords more space for the temporal muscle." In other words, the negro has a more fully developed temporal muscle than the white man; that is, he approaches nearer to the *Carnivora*. This general statement is not confirmed by any cranial measurements, neither does Mr. Humphrey state what he means by a negro — of course, one of the black race. But under the term "black race" are included the Oceanic negroes, as well as the natives of central and southern Africa Probably he intended, as in common parlance, to designate the African, although this designation is ambiguous, as it is well known that the crania of the different tribes of Africa differ very essentially in their general formation, as well as in their special cranial measurements.

Although the cephalic measurements of Broca, Topinard, and others allow a slight increase in the horizontal curvature of the arch in certain instances, which, if they indicate anything, signify a greater development of the temporal muscle, as well as a more extended surface for the attachment of the masseter, both of which, as we have seen, highly characterize the arch in the *Carnivora;* yet, as Topinard remarks, in speaking of the bi-zygomatic diameter, which may be accepted as the criterion of the greatest facial width: "This measurement by itself often presents difficulties, purely accidental and local, and entirely apart from the general type. Thus, in every race, cases occur in which the zygomatic process of the squamosal, instead of joining directly with the molar, bends outwards and then resumes the general characteristic direction of the arch, whether this be straight or gently curved. The greatest width under these circumstances falls upon the summit of the bend, which causes the measurement to be unduly augmented."

As a result of the measurements taken upon the crania of the Africans in the collection of the Peabody Museum, and of the Harvard Medical School, there was a slight increase in the bizygomatic breadth over those of other mixed European skulls. But no dependence should be put in such measurements, for although in one collection the crania were classified in general as African, nothing was known of their history, and still less of those with which they were compared.

According to an extract from M. Pruner-Bey's tables, as given by Topinard, the bi-zygomatic breadth, compared with the total length of the face, is greater in the Esquimo, Chinese, Scandinavians, Germans (south), and New Caledonians than it is in the negroes of Africa. In the category of crania in the British Museum Mr. Flower gives the index of breadth of the African negroes of various tribes. The low conformation of those, in this respect, is only exceeded by the Eskimo, Australians, Melanesians, Kaffirs, and Zulus.

In order to substantiate the statement made by Mr. Humphrey it would seem to be much the most scientific method to ascertain by measurement the actual width of the groove in the upper surface of the posterior root of the zygoma of the African skull, and compare this with that of other races. This can be properly effected by taking first the bi zygomatic breadth, and then the bi-squamosal at the most prominent point on the line of suture between the squamosal and alisphenoid, the difference between the two measurements would give the breadth of groove.

Cuvier reminds us that the size of the temporal fossa and its muscle have close relation with the age of the animal. In the young, the brain and its case are developed, but the jaws are small, and the forces which move them are wanting in energy. But with age these last are developed, while the intellectual powers constantly diminish. In civilized man the equilibrium is maintained between the growth of the brain-case, the intellectual powers, and the masticatory organs. Can any relation, however remote, be traced between the developed masticatory powers of the uncivilized negro, and the flattened squamosal in his brain-case as described by Mr. Humphrey? D. D. SLADE.

Cambridge, Mass., May 27.

Anatomy of the Apteryx.

BY far one of the most important anatomical papers which has appeared since the present year commenced is a memoir by Professor T. Jeffrey Parker, F.R.S., of the University of Otago, New Zealand, entitled "Observations on the Anatomy and Development of Apteryx." This remarkable bird-form, now becoming quite rare, is so well known to biologists that the several species of the genus will require no special description from me here. Nor will the vast importance to anatomical science of a complete study of its structure and embryology stand in need of comment. What Mr. Parker has accomplished in that direction is now before me, — one of the classical publications of the Royal Society of London, brought out through its Philophical Transactions, it being the work to which I desire to invite attention.

This monograph is in the usual quarto form, and covers 134 pages, and is illustrated by sixteen lithographic plates, beautifully executed in color. These last are devoted to the external characters of the embryo; to sections of the same; to graphic representations of the rate of growth; to the morphology of the skull and skeleton of the young at various stages; and to certain parts of the anatomy of the adult. They include 310 figures. *Apteryx bulleri*, *A. australis*, and *A. oweni* are followed, more or less completely, through fourteen various stages of their growth, the whole resulting in a very full embryological chapter. Among the more important points arrived at by our author are, (1) in the adult *Apteryx*, as well as in advanced embryos, the pterylosis is by no means uninterrupted, as was originally supposed to be the case by Nitsch; (2) that the lateral apterial space has a definite function in connection with the attitude assumed by the bird during sleep; (3) that the study of the structure of the wing of *Apteryx* lends support to the view that the *Ratitæ* are the descendants of birds which possessed the power of flight; (4) the demonstration of the law of growth of *Apteryx*, giving the stages in which the head, beak, brain, sternum, and limbs arrive at their maximum dimensions, and the comparative and relative rates of the growth; (5) the specific and sexual differences; (6) the discovery of nine more muscles in the wing of the adult than were known to Owen, our former authority on the subject; and (7) the presence of the pecten in the eye during embryonic life.

In conclusion the phylogeny is given, and under that caption are arrayed the characters which go to support the view that *Apteryx* is derived from a typical avian form capable of flight. Fifteen characters are well chosen for that purpose, — the only opposed one suggested being the total absence of rectrices in *Apteryx*. This *résumé* is followed by a summary of other sets of characters supporting (1) the derivation from a more generalized type than existing birds, and the converse, (2) as exhibiting greater specialization than other birds. Fifty-five works are given in a list at the close of the monograph, as having been referred to during its production. Only one American authority is mentioned, and we must believe that the important labors of Morse on "The Carpus and Tarsus of Birds" would have been found useful, to say not a word of a number of others.

It remains for me but to say that this admirable paper of Professor Parker's will surely make its influence felt at once, and will