

times of service in breaking up adhesions and increasing the range of motion. Special exercises to strengthen the weak extensors and abductors are of course indicated in all cases.

The advantages of this operation are that immediate replacement with comparatively small danger of relaxation is assured, while the limb remains in the normal attitude. The disadvantages are the limitation of motion or even ankylosis that may result.

Ankylosis following the operation in unilateral displacement, provided there is no distortion of the limb, is a marked improvement on the original dislocation, but bilateral ankylosis would practically disable the patient. For this reason one should await the result of the operation on one side before treating the other.

Ankylosis is, however, the exception, and in many instances practically normal, or at all events a sufficient range of motion remains. The degree of final disability depends in great part upon the after-treatment. If deformity is prevented, and if the muscles are strengthened by massage and by exercises, a practical cure may be attained, although in most instances a slight limp will persist even in favorable cases.

The danger of the open operation is slight in the hands of competent surgeons, less even than it is in the other method when great force is required to reduce the displacement, as in the treatment of older children.

In conclusion it may be said that the prospect of success in the treatment of congenital dislocation of the hip stands in direct relation to the age of the patient, since the extent of the pathological changes that make cure difficult or impossible depends in great degree, as in acquired dislocations, upon the duration of the disability. Consequently treatment should be applied as soon as the displacement is discovered, and there is little excuse for not making the correct diagnosis as soon as the child begins to walk. The treatment of selection before the age of six years is the functional weighting method of Lorenz. By this means a certain proportion of the cases may be cured, and in all instances the posterior may be changed into an anterior displacement, which makes the after-treatment much easier. If this treatment is ineffective it should be followed by the open method. In the younger patients simple incision and forcible stretching of the capsule may be sufficient, if the acetabulum is well formed; if not, it will be necessary to enlarge it to a sufficient size. Osteotomy may be necessary to correct anteversion of the neck of the femur whichever method is employed to reduce the displacement.

The treatment of congenital dislocation of the hip is not likely to be successful beyond the age of ten years, although in favorable cases it may be attempted. In exceptional cases at the age of adolescence or in adult life, the discomfort attending the dislocation may necessitate excision of the hip. In other instances adduction and flexion deformity may require osteotomy to correct practical shortening.

OTHER CONGENITAL DISLOCATIONS.—Congenital misplacements at other joints are quite insignificant when compared with that at the hip, and in only two situations is the disability of sufficient importance to require especial consideration. These are the shoulder and the knee.

Congenital dislocation at the shoulder may occur in two forms, one in which there is actual misplacement before birth, and the other in which a dislocation is caused by violence at birth. In either case the displacement is almost always backward upon the dorsum of the scapula (subspinous). Thus the arm is abducted and rotated inward and there is the characteristic limitation of motion.

True primary displacement of either variety is rare. Many of the reported cases were apparently subluxations, secondary to the relaxation of the capsule of the joint and to the muscular atrophy caused by anterior poliomyelitis, or to the habitual malposition due to obstetrical paralysis.

Treatment.—The only treatment of a dislocation is re-

placement of the displaced bone if it be possible. If the displacement were discovered in infancy it might be possible to reduce it by manipulation and, unless the glenoid cavity were undeveloped, it might be retained in proper position. As a rule, however, the cases are not seen until later childhood when the accommodative changes are marked.

Phelps, of New York, has reported several cases of congenital dislocation of the shoulder, caused apparently by injury at birth, as they were accompanied by paralysis. In one case, that of a boy eight years of age, the joint was opened by a posterior incision along the border of the deltoid muscle. The head of the scapula was found to be atrophied, and the posterior margin of the glenoid cavity broken away. This, together with the contraction of the tissues on the anterior aspect of the joint, made it necessary to cut away a part of the head of the bone in order to replace it. The secondary depression on the scapula was excised and the redundant capsule was removed. The immediate result of the operation was very favorable. Phelps states that he has operated in two similar cases, but a final report of the results has not been presented.

It would seem, however, that as in a posterior displacement the contracted tissues must be those in front of the joint, an anterior rather than a posterior incision would be preferable. In all cases the open operation should be deferred until after the contracted parts have been stretched by manual force in the manner described in the treatment of congenital displacement of the hip.

Cases of congenital displacement in other directions are recorded, but these are so rare as to be of little practical importance.

Congenital Genu Recurvatum, or Anterior Displacement of the Tibia.—The most common of the congenital deformities at the knee is the so-called genu recurvatum, in which the knee is bent somewhat backward, or, in other words, the leg is hyperextended on the thigh. The deformity is often classed as an anterior dislocation, but there is no actual displacement, except in the extreme cases in which the tibia may be turned directly forward on the femur, even to a right angle or less. In the ordinary cases the range of extension is merely exaggerated, while flexion is limited or checked, principally by adaptive shortening of the quadriceps extensor muscle.

The appearance in well-marked genu recurvatum is very peculiar; it is as if the patient's limb were reversed, the popliteal depression having become a prominence,

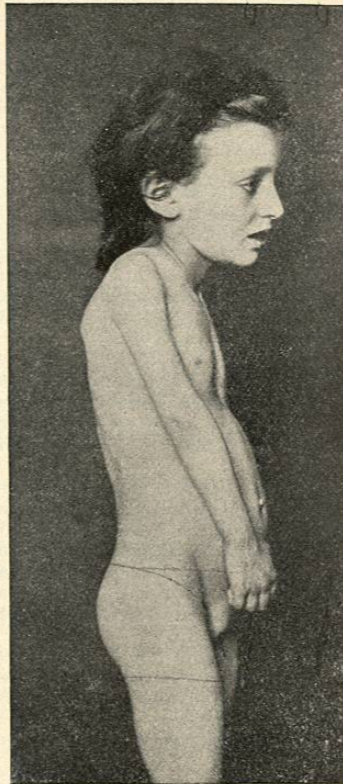


FIG. 2655.—Congenital Dislocation of the Right Shoulder.

the range of overextension representing apparently normal flexion. In such cases the leg may be brought to the straight line, but greater flexion is resisted by the retracted tissues, and when the pressure of the hand is removed the leg is drawn back to the deformed position by the contraction of the quadriceps extensor muscle.

Genu recurvatum is not infrequently accompanied by varus or valgus deformity at the knee, more often by the latter, and by laxity of the ligaments. In many instances the patella is absent or is rudimentary and not infrequently deformity is accompanied by malformations or defective development of other parts.

Etiology.—The deformity in cases of simple recurvatum may be explained by an abnormal and fixed position in utero, and in cases seen soon after birth the mechanism is clearly shown by the habitual attitude. The thighs are sharply flexed on the body, the dorsal surfaces of the hyperextended knees are in relation to the abdomen, while the feet may be brought into contact with the face or trunk according to the degree of deformity. The retarded development of the quadriceps extensor muscle explains the rudimentary patella which is often an accompaniment of the deformity.

Treatment.—The treatment of the hyperextended knee is very simple. It consists in massage of the atrophied and contracted muscle, combined with more or less forcible manipulation in the direction of flexion. If, as is often the case, the leg seems to be drawn forward by spasmodic muscular action, the methodical massage should be combined with the use of a simple posterior splint.

In the more extreme cases manual force may be applied under anesthesia, and the deformity may be overcome at one or several sittings according to the resistance of the contracted parts. The leg is then fixed in a flexed position until the tendency to recurrence has been overcome. When the child begins to walk a light lateral brace may be necessary to insure perfect functional use of the joint, as in many instances laxity of ligaments and muscular weakness may persist for a time.

Rudimentary or Absent Patella.—As has been stated, a rudimentary patella is a frequent complication of genu recurvatum, or of any congenital defect or deformity of the knee or limb that involves imperfect development of the quadriceps extensor muscle. In many cases of this type it is impossible to distinguish the patella during the early months of infancy, but later a minute patella appears that slowly increases to an approximately normal size.

Absence of patella under the same conditions is less frequent, although Potel collected one hundred cases from literature.

Treatment.—The treatment of rudimentary patella is included in the massage and stimulation of the atrophied or rudimentary muscle with which it is usually associated, and the support that the weak or deformed knee may require. *Royal Whitman.*

HIPPOCRATIC OATH.—The ancient Greek writings commonly called "The Works of Hippocrates of Cos" were judged even by ancient Greek critics to be really by various authors. The truth of this conclusion is plain to modern scholars. These writings have probably existed in some sort a collection since the early days of the Alexandrine library near the beginning of the third century B.C.; and the composition of the several writings may safely be referred to the fifth or fourth century. Which of them are truly works of the famous physician whose name they bear is quite uncertain, as no direct contemporary testimony exists. Modern critics can only sift internal evidence, and compare the views of earlier critics, ancient, perhaps, but often naïve or biased. Many writings in the collection, however, are plainly as old as Hippocrates, if not older. He was born in 460 B.C.; died, probably, in 377 B.C.; and was a worthy of the great period often styled that of Pericles. There is no proof, however, that Hippocrates was ever at Athens, though

he was known there; and scarcely anything is known of his life with certainty.

One of the most famous writings of the Hippocratic collection is that entitled "The Oath." It is probably at least as ancient as Hippocrates, but that he composed it can neither be affirmed nor denied. Traces of its wide-spread influence occur in history; and by means of it modern physicians still hand down the traditions of their calling to those about to receive a medical degree. The ancient words do not accord with the changes wrought by twenty-two centuries in men, beliefs, and manners; but no modern words can be nobler, and the ancient thoughts are vital to the modern oath. The following translation of the Greek original into English is by the present writer:

THE OATH.

I swear by Apollo the Physician, and Æsculapius, and Hygeia, and Panacea, and all the gods and all the goddesses—and I make them my judges—that this mine oath and this my written engagement I will fulfil so far as power and discernment shall be mine.

Him who taught me this art I will esteem even as I do my parents; he shall partake of my livelihood, and, if in want, shall share my goods. I will regard his issue as my brothers, and will teach them this art without fee or written engagement if they shall wish to learn it.

I will give instruction by precept, by discourse, and in all other ways, to my own sons, to those of him who taught me, to disciples bound by written engagement and sworn according to medical law, and to no other person.

So far as power and discernment shall be mine, I will carry out regimen for the benefit of the sick, and will keep them from harm and wrong. To none will I give a deadly drug, even if solicited, nor offer counsel to such an end; likewise to no woman will I give a destructive suppository; but guiltless and hallowed will I keep my life and mine art. I will cut no one whatever for the stone, but will give way to those who work at this practice.

Into whatsoever houses I shall enter I will go for the benefit of the sick, holding aloof from all voluntary wrong and corruption, including venereal acts upon the bodies of females and males whether free or slaves. Whatsoever in my practice or not in my practice I shall see or hear, amid the lives of men, which ought not to be noised abroad—as to this I will keep silence, holding such things unfitting to be spoken.

And now if I shall fulfil this oath and break it not, may the fruits of life and of art be mine, may I be honored of all men for all time; the opposite, if I shall transgress and be forsworn.

The best Greek text (from which the foregoing translation was made) is that of E. Littré, "Œuvres complètes d'Hippocrate" etc., tome 4, Paris, 1844, pp. 628 to 632.

Many commentaries have been published upon the oath. Among these, special mention is deserved by Littré's Argument, *l. c.*, pp. 610 to 625; and by the notes of C. Daremberg, "Œuvres choisies d'Hippocrate," seconde édition, Paris, 1855, pp. 1 to 11.

The following matters require discussion, more or less brief:

Hygeia and Panacea were daughters of Æsculapius. The distinction between "precept" and "discourse" (*παραγγελίας τε καὶ ἀκροήσεως*) has not been explained satisfactorily.

"Suppository" is perhaps as nearly equivalent as possible to the Greek word *πεσσός*, which doubtless means, in the oath, a sort of medicated pledget to be withdrawn after a longer or shorter time. Many formulæ for making such, for various purposes, are given in the Hippocratic collection.

The words "destructive suppository" (*πεσσὸν φθόρον*) refer to abortion. A parallel and fully developed phrase, viz., "a wine destructive to embryos" (*φθόριος ἐμβρύων*)

oivos) occurs in the *Materia Medica* of the later Greek physician Dioscorides, of the first century A.D. (Lib. v., cap. 77, ed. Sprengel, vol. i., p. 734). Although abortion is abjured without qualification in the oath, there were probably Greek practitioners of the time of Hippocrates who made a distinction similar to the modern one between justifiable and criminal abortion; for methods of emptying the uterus are frequently and quite simply referred to in the Hippocratic collection, though often expressly aimed at embryos styled "dead" or "livid" or "motionless" or "stricken" or "apoplectic."

But there is also good reason to believe that, in Hellas, the accepted line between guilt and innocence in the matter of abortion did not always coincide with that drawn nowadays. The clear recognition of the fact that the early embryo is from the instant of conception a human being, truly alive and possessing the right to live, even before the "quickening,"—this doctrine is entrenched in a maturer knowledge of physiology than the ancients could command. In the ideal State discussed in Plato's dialogue of "The Republic," certain embryos irregularly begotten were to be made away with before birth (ed. Stephanus, p. 461c). Plato was a younger contemporary of Hippocrates, and Plato's pupil, Aristotle, was born a few years before the death of the great physician, and was himself an Asclepiad, *i. e.*, a physician's son. Aristotle, in his "Politica," expressly recommends abortion in order to limit the number of children, but enjoins the procuring of it "before the advent of sensation and life." The presence of these he formally makes the criterion of "the hallowed" and the reverse in this matter (Politica, vii., cap. 16, ed. Ac. Boruss., p. 1335, b 19 to 26).

In the embryological treatise "On the Nature of the Child" in the Hippocratic collection, the author, who may not have been of Cos, but possibly an adherent of the rival school of Cnidos, describes a certain case as one of abortion at the sixth day deliberately procured by himself. The circumstances are given in detail, and plainly stamp the case as criminal according to modern ideas; but the author relates it without a trace of guilty consciousness, adhering, one may conjecture, to the doctrine of morals set forth by Aristotle (Hippocrates de Nat. Pueri, § 13, ed. Littré, vii., p. 488). The following striking passage both shows us "strict constructionists" of the Hippocratic oath nearly five hundred years after the death of Hippocrates, and sets forth explicitly, as current eighteen centuries ago, a view of the morals of abortion closely akin to that of modern physicians. The Greek gynecologist Soranus of Ephesus was a practitioner at Rome under the emperors, not far from the time when Juvenal was scourging its vices with his satires in the earlier years of the second century A. D. Referring to abortion, Soranus writes:

There is a disagreement; for some reject destructive practices, calling to witness Hippocrates, who says, "I will give nothing whatever destructive," and deeming it the special province of Medicine to guard and preserve what Nature generates. Another party maintains the same view, but makes this distinction, *viz.*: that the fruit of conception is not to be destroyed at will because of adultery or of care for beauty, but is to be destroyed to avert danger impending at parturition, if the uterus be small and cannot subservise the perfecting of the fruit, or have hard swellings and cracks at its mouth, or if some similar condition prevail. This party says the same thing about preventing conception, and with it I agree. (Translated by the present writer from the Greek of Soranus, *Gyneciorum Lib. i.*, cap. 19, ed. Rose, p. 229).

The abjuration of lithotomy in the oath contains the only mention thereof made in the Hippocratic collection. The ancient practitioners of medicine freely practised operative surgery; and no certain cause can be assigned for their refusal to cut for the stone. It has been shrewdly guessed, however, that the cause lay simply in the formidable dangers of a rude and uncertain procedure.

As the Hippocratic oath still plays a part in medicine

worthy of its character and history, it has been thought proper to end this article with one of the modern adaptations. At the annual commencement of Columbia University in the City of New York, the following oath is administered to the graduating class of its College of Physicians and Surgeons:

Candidates for the Degree of Doctor of Medicine:

You do solemnly swear, each man by whatever he holds most sacred:

That you will be loyal to the Profession of Medicine and just and generous to its members;

That you will lead your lives and practise your art in uprightness and honor;

That into whatsoever house you shall enter, it shall be for the good of the sick to the utmost of your power, you holding yourselves far aloof from wrong, from corruption, from the tempting of others to vice;

That you will exercise your art solely for the cure of your patients, and will give no drug, perform no operation, for a criminal purpose, even if solicited; far less suggest it;

That whatsoever you shall see or hear of the lives of men which is not fitting to be spoken, you will keep inviolably secret.

These things do you swear? Let each man bow the head in sign of acquiescence.

And now, if you shall be true to this, your oath, may prosperity and good repute be ever yours; the opposite, if you shall prove yourselves forsworn.

In this oath, the words "that you will be loyal to the Profession of Medicine, and just and generous to its members," are from a formula at one time in use at the above-named medical school; for the rest of the foregoing adaptation the present writer is responsible.

John G. Curtis.

HIRUDINEA.—Among the Annelida or segmented worms the leeches form a well-marked order. The body of the leech is elongated, usually flattened dorso-ventrally, and provided with a prominent terminal or sub-anal sucker, while many forms possess also an anterior or oral sucker. The bristles all but universally present in annelids are here wanting save in a single genus, and the metamerism of the body presents a poorly marked external aspect although actually highly developed. The rings which appear in external view are mere surface markings, and are variably related to the true somites. Of the latter there are always thirty-four (thirty-five), of which those in the central portion of the body possess the typical number of annuli, while the first few and last few manifest ordinarily a reduction from that number. Prominent papillae may usually be observed on the dorsal surface in the form of six or eight longitudinal rows; these are metameric sense organs known as sensillae, and the eyes which vary in number in different forms are anterior units in certain of the rows. The annulus bearing the sensillae is now generally regarded as the central one of the typical three- or five-ringed somites, and is the only one present in case of those somites manifesting the extreme of reduction. The leeches are hermaphroditic and the two sexual pores lie in the midventral line, the male in front of the female orifice.

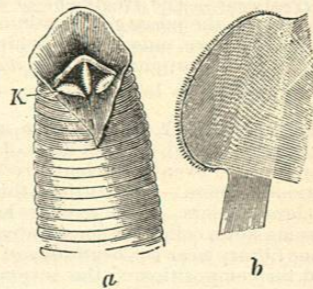


FIG. 2656.—*Hirudo medicinalis*, or European Leech. a, Ventral aspect of anterior end, showing an open mouth at the bottom of which the jaws, K, are visible; b, one of the jaws isolated, showing marginal denticles and muscles. (After Claus.)

The family of the Gnathobdellidae, or Round-jawed Leeches, is characterized by three saw-toothed jaws in a simple pharynx (Fig. 2656); the typical somite has five annuli. Among the fresh-water leeches (*Natantia*), which have an eyeless ring between the third and fourth pairs of eyes, only the monostichodont forms (*i. e.*, those with a single row of teeth in each jaw) are important, and of these only two genera need be noticed here.

Hirudo L.—Either one hundred and one or one hundred and two rings with twenty-six metameres between the first pair of eyes and the sucker of which the first six and the last four are abbreviated. Buccal and post-buccal rings fused below; only three annuli in somite XXIII. Each jaw has from fifty to one hundred sharp-pointed teeth. Male genital pore between annuli 30 and 31, female between 35 and 36. First pair of nephridial pores ventral in ring 13, last in ring 93; seventeen in all.

Hirudo medicinalis L.—*Sanguisuga medicinalis* Savigny 1820, *S. officinalis* Savigny 1820, *H. officinalis* Derheims 1825. Length 100 to 200 mm.; breadth 10 to 30 mm. Jaws large, each with 80 to 90 teeth. Color variable,

darker above than below, dirty yellowish-brown in tone with tendency to gray or green; at the margin a bright yellow or brown band with black margins; on the back three more or less prominent red longitudinal bands spotted with black (Fig. 2657).

This species is native in Europe, northern Africa and southwestern Asia, but at present is extinct in many regions and obtained by artificial culture or through importation only. Among the very numerous color varieties, as many as sixty-four being recorded by Diesing, two have been recognized as sub-species or varieties:

The Green Leech, var. *officinalis* s. str., back greenish-gray with three russet-red lines on each side, of which the middle one, and often the inner also, shows a black spot on each metamere. Ventral surface greenish-yellow and spotted with black.

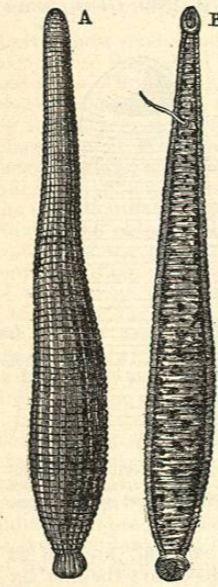


FIG. 2657.—*Hirudo medicinalis*, or European Leech. A, Dorsal aspect; B, ventral aspect. (After Railliet.)

entirely unspotted. A series of intermediate forms makes a distinction even between these two varieties difficult in many cases.

The leech sucks from four times its volume of blood for the young to three times in an adult, or from 6 to 15 gm. If, however, the sucking leech be cut in two by the shears close behind the pharynx, the blood streams out in pronounced pulsations and, as the sucking action is not interfered with, a stronger or rather longer-continued blood extraction is caused. During the ordinary operation of sucking a leech gives off a large quantity of clear fluid which exudes from the skin in drops. It is not blood serum, as often supposed, but the secretion of the nephridial canals. While this exudation ceases at the end of ten days, the assimilation of the stomach contents of the leech demands from twelve to eighteen months. At the end of two months, however, the animal manifests willingness to bite, but its full appetite is not yet restored. On the other hand, the leech can fast for two years or more and may be kept indefinitely without food in suitable leech jars. A fast of from six to eight months is necessary before re-employment; but the latter is not advisable. Before the third year of their growth leeches

are not used for medicinal purposes, and from eighteen to twenty years has been put as the probable length of life. For the method of using leeches, see *Blood-letting*.

At one time the enormous demand for leeches reached, for example, 7,000,000 per year in London alone, but in recent years their use for therapeutic purposes has greatly diminished, no doubt largely as the result of occasional fatal cases and in spite of certain evident advantages for local affections. Fatal bleeding has been known where the bite opened a large vessel (*cena cruralis* or *jugularis*), or in internal organs where the leech, by careless application at the nasal fosse, vagina, or rectum, has penetrated or been drawn too deeply into the organ. In order to guard against this leeches should be fastened in such cases by a thread passed through the middle of the posterior sucker. Several authors have investigated the reputed transmission of disease, particularly bacterial, by leeches, but uniformly with negative results. So far as bacteria are concerned, the species studied were rapidly digested in the stomach of the leech, and the entrance into the wound of such as may be upon the lips at the start appears difficult under the circumstances of the blood flow.

Where native, these, like other large leeches, attack men and animals invading swamps and pools, and in recorded instances with fatal results to children or young animals.

Hirudo troctina Johnson 1816, often confused with the medicinal leech, is distinguishable by its smaller size, 80 to 100 mm. in length by 12 to 18 mm. in breadth, and especially by the scantier number of teeth, about seventy, in each jaw. It is native in northern Africa and Spain, perhaps also Italy and Sicily, and is exported in large numbers to France, England, and America. In power to extract blood it is much inferior to *H. medicinalis*.

Hirudo nipponica Whitman 1886, also smaller in size than *H. medicinalis*, is common about Tokyo, Japan, and in other parts of the island. Its habits and use conform closely to those of the continental species. Other species of similar habit are reported from different regions of the Orient; they are, however, only poorly known.

The genus *Limnatis* may be distinguished from *Hirudo* by the papillae on the jaws and by the ventral furrow traversing the entire length of the anterior lip of the oral sucker. One species, *Limnatis nilotica* Sav., demands brief notice. It is native in the circummediterranean region, and in some places is so abundant as to become a veritable pest. Especially the young, described by Moquin-Tandon as *Sanguisuga aegyptiaca*, are often swallowed accidentally in drinking and may remain for a long time fixed in pharynx, choana, oesophagus, trachea, or even stomach. The species plays accordingly an important rôle in diseases of man and domestic animals in northern Africa during the hot season. European soldiers in garrison, and even natives, in spite of their precautions, suffer from the leech, which evokes by its presence both local and general symptoms of serious character if assistance is not speedily afforded. With the removal of the worms rapid and complete healing of the wounds and disappearance of secondary symptoms occur almost immediately and without exception. The removal may be accomplished by instruments from those organs where the leech can be seen; in deeper locations copious application of salt water is said to be efficacious. This leech can pierce only the mucous membranes of higher animals, and its inability to penetrate the external skin, even of children, has often been demonstrated. Other species of this genus have a more powerful bite, and are used especially in the East for medicinal purposes, even though they take up less than half as much blood as *Hirudo medicinalis*. In this country *Macrobella decora*, one of the large native leeches, is employed in some places for blood-letting; it may be recognized by the following description:

Macrobella Verrill 1872. Cephalic lobe smaller than in *Hirudo*. Annuli 103; at least four in somite XXIII.

Neither buccal nor post-buccal annuli united on the ventral side. Both genital orifices in somite XI, and behind them a group of prominent copulatory glands.

Macrobella decora Verrill.—*Hirudo decora* Say 1824, *H. decora* Leidy 1868. Jaws with about sixty-five teeth, copulatory glands opening by four pores in a quadrate figure on the last annulus of XIII. and the first two of XIV. The first annulus of XXVI. is divided marginally and sometimes also dorsally into two annuli.

This species is widely diffused in fresh waters of the United States, having been reported from Maine to Minnesota and from Pennsylvania to Kansas. It is frequently used instead of imported leeches by physicians and is said to be equally efficacious, although its capacity is somewhat smaller, only about 5 gm. It is so powerful, however, that serious results have followed its attacks upon the legs of children wading in its haunts.

Among the land leeches which form a special section, Reptantia, of this family, and are distinguished by the absence of an eyeless ring between the third and fourth pair of eyes, a few forms deserve brief mention.

Hemadipsa Tennent. Body almost round, sucker separated only by a slight constriction. Near the sucker auriculae with the pores of the last pairs of nephridia. Typical metamere with five annuli.

Hemadipsa zeylanica Moq.-Tand.—*H. japonica* Whitman. Length 20 mm., or in extended form 60 mm., diameter of body behind 6 mm., in front 2 mm.; sucker 5 to 7 mm. in diameter. Annuli ninety-seven; male genital pore between annuli 30 and 31, female between 35 and 36. In each jaw ninety incurved teeth.

The animal, when gorged, has the form of a flask of about 10 mm. in diameter at its largest part, while the neck measures only 2 or 3 mm. in thickness. The color is exceedingly variable, and yet five or six varieties may be recognized, one of which, var. *japonica* Whitman, known in Japan as the mountain leech, is common in the entire Indomalayan region, China, and Japan. It has long been known on the island of Ceylon, where it forms a veritable pest to natives and Europeans alike. The leeches appear in immense swarms, particularly in moist regions and during the rainy season, and at all levels from the coast up to 4,000 feet, although they occur even as high as 15,000 feet in the Himalayas. During the dry season they hibernate in the earth; at other times they live in moss among stones and on shrubs and trees. The approach of large animals brings them out in myriads; they move with surprising activity, and springing on the unfortunate passer-by they suck often for hours before falling off. No clothing is close enough to protect man from their attacks, and during army manoeuvres they have inflicted large losses on European troops, attacking the soldiers even when asleep. Accounts of travel in Ceylon abound in narratives of the ferocity of these pests, and recent writers from the Philippines comment on their activity in that country in equally forcible terms. It is probably this species, and very likely the variety *japonica*, which is reported by Blanchard as abundant in the Philippines, to which the trouble is due, although other species of *Hemadipsa* manifest, no doubt, similar habits of life.

The bite is not poisonous, as often maintained, but the large number of wounds and careless treatment afford abundant opportunity for secondary infection of a serious character. Among the natives of Ceylon one may see many deformities induced by these leeches, which are accordingly feared more than serpents and carnivores.

An allied form, *Phytobdella Meyeri* R. Bl., is also recorded from Luzon.

The family of the Rhynchobdellidae, or proboscis leeches, is characterized by a protrusible pharynx, while the typical metamere consists of three annuli and jaws are lacking. Few of these forms are able to penetrate the human skin, but among those of sufficient power are especially American forms, which appear as occasional parasites of man and in some regions are used for therapeutic purposes. The two species of importance are both

members of the following genus, which is restricted to the warmer regions of the American continent:

Liostoma Wagler 1831—*Hæmenteria* de Fil. 1849. Body broad and flattened; back covered with many prominent papillae; the first and third ring of each somite from VI. to XXII. inclusive split on the ventral surface so that on the ventral surface the space occupied by five pseudo-annuli corresponds to that occupied by the three adjoining dorsal annuli. Male genital pore between annuli 26 and 27, female between 28 and 29. Two pairs of eyes so closely set that they appear as a single pair.

Liostoma Ghilianii R. Bl.—*Hæmenteria Ghilianii* de Fil. 1849. Length of alcoholic specimen 190 mm., breadth 100 mm., corresponding to a probable length while living of 350 to 400 mm. Annuli seventy, together with three preocular; the first seven annuli form the oral sucker.

This giant form inhabits the basin of the Amazon and the swampy regions of Guiana. Blanchard reports that it attacks horses and cattle, and a few individuals are sufficient to kill even a full-grown animal.

Liostoma coccineum Wagler 1831—*Hæmenteria officinalis* de Fil. 1849, *H. mexicana* de Fil. 1849, *Glossiphonia*

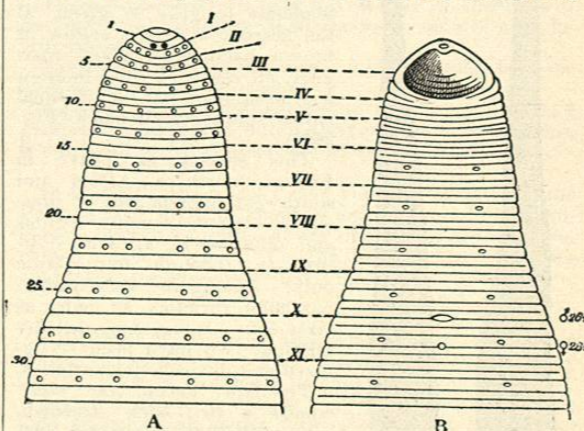


FIG. 2658.—*Liostoma coccineum*, or Mexican Leech. Diagrammatic view of anterior somites, A, from dorsal surface with eyes and sensillae, B, from ventral with nephridial and sexual pores. (Modified from Blanchard.)

granulosa Jimenez 1865. Length 80 mm., breadth 22 mm. Annuli seventy, with two preocular; the first six annuli form the oral sucker (Fig. 2658).

The range of this species extends from Mexico to Paraguay through Central and South America. In Mexico it is universally used as the medicinal leech. In some instances, however, its bite appears to be accompanied by serious results. There are noted almost immediately a feeling of general lassitude and an unpleasant itching and twitching, succeeded soon by general urticaria, and in a short time apoplectic symptoms are manifested; but cases occur in which the cerebral congestion or the urticaria is wanting. Most authors incline now to the belief that these symptoms are due to the salivary secretion poured into the bite by the leech, and yet it seems also clear that some predisposition on the part of the individual is also a prerequisite. Brandes suggests that the symptoms of poisoning are manifested only in persons exhibiting hyperæsthesia, and attributes the rare cases of serious illness following the application of *Hirudo medicinalis* in Europe to the same sensitive constitution. (Compare in this connection the effects produced by the bite of *Argas*, as reported by Brandes and noted in the article *Arachnida*, Vol. I., p. 437.)

In spite of these accidents this is actually the only species used for medicinal purposes in Mexico, sufficient evidence of its generally satisfactory character. In some provinces (Guadalajara) the leech is regularly cut in two after it has taken hold in order to measure definitely the quantity of blood extracted.

Henry B. Ward.

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HISTOLOGICAL TECHNIQUE.—METHODS OF STUDYING LIVING AND FRESH TISSUE.—For observations on living tissue, we now make use of the cold-blooded ani-

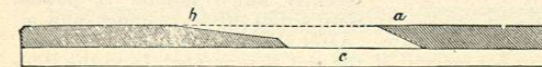


FIG. 2659.—Schulzer's Larva Holder.

mals almost exclusively; and, on account of the convenience, use the tails of amphibian larva, and small fishes and frogs. For holding these small animals, while under observation, the larva holder of Schulzer (Fig. 2659) will be found very convenient. The head of the animal is placed under the edge, *a*, the tail is spread out on the bevelled plate, *b*, and covered with a cover-glass. The cell holds sufficient water to cover the animal. To keep the animal quiet, we wrap it loosely in a piece of cloth, leaving the gills free, or add a few drops of ether to the water. If the observations are to be continued for any length of time, provision must be made for the renewal of the water. This can be accomplished by any of the usual methods of irrigation.

For observations on the frog, it is necessary to paralyze the animal with curare. A slight nick is made in the skin over the posterior part of the head, and two or three drops of a one-twentieth-per-cent. solution of curare* is injected into the dorsal lymph sac by means of a long, slender pipette introduced through the above nick. The exact amount of curare to be used will depend upon its quality and the size of the animal, and can be determined only by experiment. In the course of a few hours the animal will become completely paralyzed, while the vegetative functions continue, the necessary amount of oxygen being supplied by cutaneous respiration.

We utilize for these observations:

1. *The Web.*—The advantage of this part of the animal is that

we do not inflict any injury, consequently we are not likely to meet with any disturbances of the vital processes; but, on account of it not being very transparent, it is inferior to other parts. A frog poor in pigment should be selected, and after being wrapped in a moist cloth it is laid on an oblong sheet of cork, in one end of which a hole, at least 15 mm. in diameter, is made; at the edges of this hole four or five pins are stuck, to which bits of

* S. H. Gage recommends the following solution: Curare, 0.2 gm.; ninety-five-per-cent. alcohol, 20 c.c.; water, 20 c.c. Grind up the curare in a mortar with the water and alcohol. Do not filter.

soft string attached to the toes are tied, spreading the web out over the hole. The cork is now placed on the stage of the microscope, and the web is moistened at intervals to prevent its drying.

2. *The Tongue.*—For observations on this and other organs of the animal, Professor Thoma has invented a series of frog plates, which are shown in Fig. 2660. The one in the centre of the figure is for the tongue; that on the left for the mesentery; that on the right for the lung and bladder. These plates consist of a bed plate, *a*, of brass, covered by a thin sheet of hard rubber. At *B* is an opening, which varies in the different plates, covered with a thick glass plate on which the organ to be examined is placed. At some distance from this glass plate runs the brass rim, *c, c, c*, 7 mm. high, which by a proper inclination conveys the irrigating fluid, as it flows off the organ, to the tubes, *d, d*, to which are attached rubber tubes leading to a vessel for receiving the waste fluid. The supports, *t*, are for holding the irrigating cannula, *g*. They are pivoted to the plate, and move on a perpendicular axis; to the upper end is attached a short split tube, which is tightened by a small screw; this is connected with the support by a hinged joint, allowing it to be moved on a horizontal axis. In this tube is placed the glass irrigation cannula, *g*. It will be noticed that in the tongue and mesentery plates two supports are provided. This is to allow of the use of two cannulae, one for irrigating the upper, and the other the under, surface of the organ. At *e* is a perpendicular rod for supporting the ring holding the cover-glass. At each side of the plates (in the tongue plate it is at the end) is a notched support, *k*, for holding the rubber tube attached to the cannulae introduced into the different organs for inflation, etc. Between the rim, *c, c, c*, and the plate, *B*, bits of cork are wedged for pinning out the organs.

For examining the tongue, the animal is placed on the plate belly down, and the nose is brought close to the edge of the glass plate; the tongue is drawn out over the plate, and fastened to the bits of cork by pins which are cut off short.

3. *The Mesentery.*—Male frogs are to be used, so that the examiner may not be embarrassed with the ovaries. An incision is made through the skin, on the side, from the pelvis nearly to the axilla. After all hemorrhage has ceased, the abdominal cavity is opened by an incision of 10 to 20 mm. in length; a coil of intestine is drawn out carefully over the glass plate so that it will fall upon the bits of cork, to which it is pinned, leaving the mesentery spread out in a thin layer on the glass plate.

4. *The Bladder.*—A glass cannula (*B*, Fig. 2661) is filled with a three-fourths-per-cent. salt solution, and the rubber tube closed with a bit of glass rod. The cannula is now in-

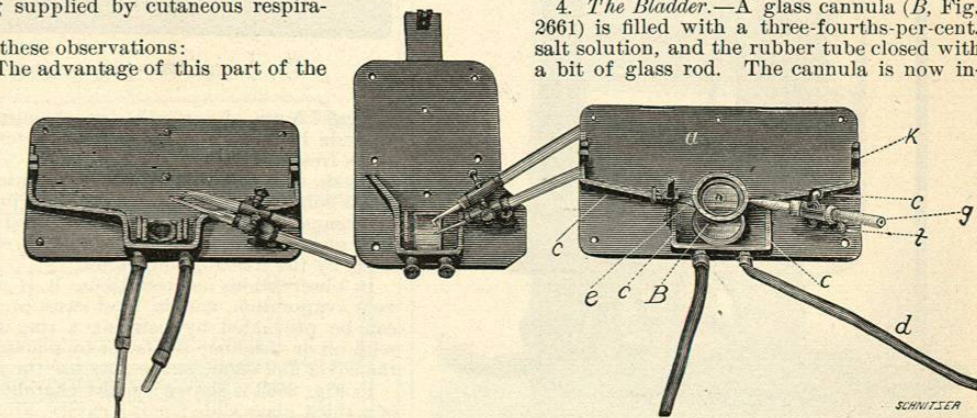


FIG. 2660.—Thoma's Frog Plates.

serted into the cloaca, and directed forward into the bladder; it is held in place by a thread passed through the skin over the sacrum and tied around the cannula. An incision, similar to the one for the mesentery, is made in the side of the animal. The glass rod is removed from the rubber tube, and the latter is raised slightly so