the head here taking place can be made, based upon a study of the forces of resistance met at the narrowed inlet, the most reliable information regarding the action of which can be gained through an investigation of the effects produced at the yielding cranial sutures. At each of these several sutures the extent to which the bones overlap might reasonably be taken as an index of the relative degrees of pressure exerted upon the bones themselves, while that bone which is depressed beneath its over-riding fellow might be regarded as the one having received the greater pressure of the two. Reasoning from such premisses, the actual findings here would seem to indicate the action of forces of counterpressure of varying intensity upon different portions of the foetal head. Thus the greater over-lapping at the coronal and lambdoid sutures on the right side (anterior aspect) of the foetal head than on the left, at about the plane of the superior strait, would indicate a stronger resistance encountered anteriorly and antero-laterally at this level than behind. Also the absence of over-lapping at the sagittal suture, here situated well below the brim, would indicate an absence of any particular antero-posterior compression within the pelvis acting upon the parietal bones. The depression of the right parietal beneath the occipital bone, instead of its over-riding the latter, suggests its having met a resistance of especial intensity against the left horizontal pubic ramus to have thus influenced it in this particular situation. Hence it would appear that the circle of cephalic embrace at the inlet is one of unevenly distributed pressure, the greatest resistance being met anteriorly against the brim, and the least behind; while within the pelvis there seems to exist a space devoid at least of antero-posterior compressing influences.

In the presence of which observations the mechanism would plainly not be one of direct downward descent of the head into the inlet, but rather can it be imagined that, the site of greatest resistance anteriorly exercising a pivotal influence on the head, descent is taking place by rotation over this pivotal site around a transverse axis. In perfect conformity with this idea of mechanism, it can be seen how the head, sweeping over the soft tissues of the inlet posteriorly, its vertical circumferences touching the latter at each point of contact in the relation more or less of a circle to its tangent, would meet a lesser resistance in this situation than in those at which opposition is more directly encountered. Similarly as well could the non-overlapping at the sagittal suture be accounted for on the supposition that, in the rotation of the head over the brim, the long axis of the former is not tilted far enough toward the vertical position for the right parietal bone to here encounter marked resistance against the posterior surface of the symphysis. The evidence suggestive of the head's having met a resistance of especial intensity against the left horizontal pubic ramus might be interpreted as indicative of a tendency to forward rotation of the occiput, possibly here the result of a twisting action imparted by the trunk of the fetus, which is as well rotated in the same direction on its vertical axis, but to a greater degree than is the head.

In view of the foregoing, the cause of the bulging of the soft parts in the right frontal and temporal regions could as well be attributed to a pushing upward of the loose scalp tissues by the force of the friction encountered at the site of pivotal action of the brim upon the head as to a *post-mortem* change. Owing to this bulging the bitemporal diameter of the foetal head is relatively increased.

The more or less close embrace of the foetal trunk by the contracted uterine muscle suggests the probable importance of the latter as a causative factor in having determined the position of the child as here found. The position presents certain features of similarity with that existing in a frozen section of a case of generally contracted pelvis (diagonal conjugate 11 cm.), described by Professor Leopold in his recent work, *Uterus und Kind*. In his case, however, the foetus was at term, and labour was less advanced than here, the head not having become firmly fixed at the brim. The features in common are the marked forward rotation of the spinal column on the vertical axis of the trunk, the bowing forward of the back, and the opening posteriorly of the angle formed by the intersection of the long axes of the head and trunk. In Leopold's case this angle is much more marked

(95° to 97°) than here (about 135°). In the case here presented one is inclined to associate the contact of the fundus with the breech of the child on the one hand and the lateral bending of the back on the other in the relation of cause and effect.

TWO LECTURES

ON

THE TEMPLES AND RITUAL OF ASKLEPIOS AT EPIDAUROS AND ATHENS.

Delivered at the Royal Institution of Great Britain

By RICHARD CATON, M.D., F.R.C.P.

LECTURE I.

LADIES AND GENTLEMEN,—You are aware that during the last twenty-five years the energy and enthusiasm in archaeological research of such men as Dr. Schliemann have not merely thrown a considerable amount of light on historic and prehistoric Greece, but have also awakened a keener enthusiasm among classical scholars and in archaeological societies, and have even influenced Governments for the further advancement of these studies. We have seen the German Government spending large sums in the excavation of Olympia and Pergamos; the French Government has also spent much in the excavation of Delphi and on other works, each nation thus making the whole world its debtor. The American school has explored the Heræon and other classical sites, and lastly our own British school in Athens has done much, considering its difficulties and the lack of the sufficient pecuniary support with which other countries have endowed their representatives.

Although considerable interest is felt by the English public in regard to the work just referred to, one important field of investigation has remained almost unknown in this country, I mean the exploration of the shrines of Asklepios, the God of Healing, at Epidaurus and Athens, about which I am to have the honour of speaking to you. As the time allotted to us is brief, it is needful to avoid all prefatory remarks, and to restrict this paper almost entirely to a consideration of the new discoveries and to inferences from them. As a matter of fact there is but scant information as to the sanitary and medical aspects of Greek life in ancient literature. Homer and Pindar have brief references to Epidaurus and other sanctuaries; so also Plato, Hippys of Regium, Strabo, and some of the dramatists, as Aristophanes, also certain of the late Greek writers, especially Pausanias. Under these circumstances most precious are the researches made by the spade. The pioneer in this inquiry was M. Cavvadias, the eminent archaeologist, now Minister of Education in the Greek Government. He was aided efficiently by the Greek Archaeological Society. M. Stais has deciphered the hundreds of inscriptions which were found. MM. Defrasse and Lechat, and M. Girard, associated with the French school; Dr. Doerpfeld, Dr. Furtwaengler, Herr Baunack, Professor Reinach, Dr. Koechler, connected with the German school, and others, have had a share in the work; but little has been done by the English, and still less has been published in our language. An interesting paper by Professor Percy Gardner in his *New Chapters in Greek History*, some valuable references by Miss Jane Harrison, the admirable notes in Mr. Fraser's new edition of *Pausanias*, and one or two articles in American journals are among the chief. I have to express my acknowledgment to the authorities I have named, but chiefly to M. Cavvadias for his kindness in giving me special facilities in Greece, and for allowing me the use of some of his plates; also to MM. Defrasse and Lechat, who permit me to show you some of their beautiful restorations. Apart from these, most of the lantern slides I shall show you were taken by myself on the spot.¹

According to tradition Asklepios, the son of Apollo and Koroni, was born in the Hieron valley, in the Argolic peninsula; the place names still preserve the legend; the hamlet of Koroni commemorates his mother, the hill Titthion owes

¹ Of course only three or four of these can be reproduced in the *BRITISH MEDICAL JOURNAL*.

FIG. A.—1. The Propylæa. 2. Temple of Asklepios. 3. The Abaton. 4. The Tholos or Thumela. 5. Temple of Artemis. 6. Altars. 7. ? Hostel. 8. Baths of Asklepios. 9. Portico of Cotys. 10. ? Gymnasium. 11. ? Hostel. 12 and 13 ? Baths. 14. ? Hostel. 15. Temple of Aphrodite. 16. Buildings of unknown purpose. 17. Northern Boundary of Precinct. 18. Part of Southern Boundary. 19. Stadium.

its name to his having been there suckled by a goat, while on the opposite hill, Kynortion, stood the temple of the Maleatean Apollo.

The Hieron, six miles from the town of Epidaurus, was the chief seat of the worship of Asklepios, though minor ones existed in Athens, in Delphi, Pergamos, Troezen, Cos, Tricca, and other places.

Here is an outline restoration (A) (only approximately accurate) of a portion of the Hieron. [It should be stated here that all the numbers which follow correspond with those on Fig. A.] No. 1 is the Propylæa, the great ceremonial gateway of the sacred precincts.

No. 2 represents the Temple of Asklepios, the central shrine, a richly decorated and coloured Doric building, erected in the fourth century B.C., as shown in the accompanying restoration by Defrass (B). At the east and west gables were pediment groups representing a battle with Centaurs and a combat of Greeks and Amazons, together with Acroteria, Nereids alighting from horseback on the two sides, and a central winged victory. A beautiful ivory door, which cost 3,000 drachmæ, closed the sanctuary; within, the cella was only a single chamber, there being no opisthodomus. Here stood, as shown in Defrass's drawing (C), the great Chryselephantine statue of Asklepios made by Thrasymedes of Paros, a work somewhat resembling the Parthenon figure, or the vast Zeus of Olympia; the flesh was all ivory, the rest gold splendidly enamelled in colours. The god was sitting on a throne, a large golden serpent rising up to his left hand; on his right lay a dog, and in front was an altar.

No. 3, in my first illustration, is the Ionic portico or Abaton, a part of which is seen in the second photograph; the western part is in two storeys, the lower one being in the basement. It is open on the south side; a double colonnade supports the roof, the eaves of which, together with the walls and columns, probably showed colour decoration. This constituted the ward or sleeping place for the sick who were awaiting the miraculous interposition of the god. The Abaton was furnished with pallets, lamps, tables, altars, and probably curtains, the patients themselves supplying their own

bed clothing. The details of this building I shall give in my next lecture.

No. 4 is the Tholos or Thumela (shown in the annexed restoration by Defrass) (D), the most beautiful circular temple probably that the Greeks ever built, far surpassing the Philippeion at Olympia. It was built in the fourth century B.C., by Polycleitus the younger, and took twenty-one years to build; externally there was a beautiful Doric colonnade, with peculiarly rich cornice, coloured. Within was a circle of sixteen graceful Corinthian columns of marble, the wall and floor were also decorated with variously coloured marbles. Here were two celebrated paintings by Pausias, the Greek artist; the first represented Methe (drunkenness), a woman holding a large wine goblet to her lips, the glass of which was so well painted that the face was seen through it. The second, a picture of Eros (Love) laying aside his bow and quiver and taking up his lyre. Perhaps we may suppose that the painter here indicated the relation of Bacchus and Venus to the ailments which afflict mankind. The scourges which we are told the gods make out of the pleasant vices of men doubtless often brought the wealthy Greek as a suppliant to Asklepios. What was the purpose of the Tholos? Defrass and Lechat believe it was a drinking fountain, a sort of pump room, in which in old times a healing spring arose; if so, we can imagine the gouty Athenian being sent here to drink large potations of the pure element, he envying meanwhile Methe and her occupation on the wall before him. The foundations are most curious, consisting of a series of circular walls forming a labyrinth. Defrass and Lechat think this basement was a water cistern. It is not cemented, and I can find no trace of a conduit. This theory seems improbable for various reasons—for example (1), the word "thumela" means a sacrificing place; and (2) Pausanias speaks of the tholos and the sacred well as though they were entirely distinct places. More probably the tholos was employed for minor sacrifices, and perhaps the labyrinth below may have been associated with some mysterious Asklepiian rite of which we are now ignorant; or the labyrinth may have been the home of the sacred serpents. We do not

(c) Chryselephantine Statue of Asklepios (restoration).

(F) Great Theatre at the Hieron. (From a photograph.)

(D) The Tholos or Thumela (restoration).

(B) Temple of Asklepios and part of the Abaton (restoration).

quite know what were the domestic economics of these creatures; they along with the dogs were the incarnation of the god. They received from the sick the utmost veneration; perhaps this curious basement structure was their retreat, and conceivably the upper stage of the tholos was employed for the offering of sacrifices to them as representatives of the god.

(E) Temple of Artemis-Hekate (restoration).

No. 5. The Temple of Artemis (E) is smaller than that of Asklepios; the eaves were decorated by a rich cornice of sculptured heads of dogs, the attribute of Artemis-Hekate. She was a divinity of healing and succour, the chaste moon goddess, and sister of Apollo, who healed Aeneas. Acroteria of Victories decorated the western gable; within was a row of marble columns, and externally stood a triple figure of Artemis-Hekate.

Nos. 6 and 6 represent a large and a smaller altar, which stood in the open air.

No. 7. The square building has occasioned much discussion.

ROCK OF ACROPOLIS

(G) Attempt at an outline restoration of the Asklepeion at Athens.

It contains the base of an altar surrounded by many bones of sacrificial animals and much ash, also fragments of bronze and earthenware, many of them bearing dedications to Apollo or Asklepios. Its period of erection seems to have been not later than the beginning of the fifth century B.C. It contained great numbers of statues and inscriptions. It may have been a large open portico giving shelter to the sick during rain, hot sun, or cold winds; employed also for minor sacrifices and for the exhibition of statuary, ex votos, and inscriptions. On the other hand, it may have been a house for priests or officials, or even a hostel, or possibly contained the library, the locality of which has not yet been identified.

No. 8. A large building, believed to have been the baths of Asklepios, and this building perhaps may have also contained the library, which was dedicated to the Maleatean Apollo, and Asklepios, which one would think is likely to have been in some central position.

No. 9 is the portico or colonnade of Cotys, built originally of unburnt brick, and having not improbably wooden columns. These materials were often used in ancient Greece, even for important purposes, as, for example, the Heraeum at Olympia. The portico was rebuilt in more durable materials in Roman times.

No. 10. A large quadrangular building with Doric colonnade, supposed to have been the gymnasium. During the Roman period a small theatre or odeion was constructed in one of its angles. There still remain nine rows of seats, arranged in a curve, with a central gangway in front of the stage; the old Greek shafts of a part of the colonnade are still to be seen embedded in walls of Roman brick.

No. 11. The building with the four quadrangles, only lately excavated. Each quadrangle is surrounded by a large number of rooms. A colonnade ran round the interior of each quadrangle. Query, What is it?—a gymnasium, a palaestra, a college for the priests, or a great hostel? I confess the last-named seems the most probable. When one considers the large number of the sick who came to the Hieron, it is obvious that extensive accommodation must have been provided for them somewhere. The two chambers of the abaton could not have held more than 120 beds, supposing these to have been placed in two rows, or if we suppose the almost dark lower storey of the western end to have been a dormitory also, 180 would then have been the greatest possible accommodation. If this were the extreme number to be entertained, why were seats for 12,000 or 14,000 provided in the Stadium, and why was the great theatre seated for at least 9,000 spectators? It appears likely, therefore, that this and other undetermined buildings were hostels for the accommodation of those whose ailments were slight or who were convalescent.

No. 12 The Eastern Roman building seems as though it had contained baths. Hot-air or hot-water pipes may be traced there, and certain peculiar pit-like recesses strongly suggest a sort of sitz-bath. At right angles to this ran a colonnade (No. 13), and in front of it an open aqueduct with stone basins placed at every eleventh yard of its course.

No. 14 is a great rectangular building of limestone, its purpose quite unknown; it was probably a hostel.

No. 15. The Temple of Aphrodite, external to the precinct, was only excavated in 1892. It was a Doric temple. An inscription discovered on the spot speaks of the sanctuary of Aphrodite; not far from it was found a statue of the goddess in Parian marble.

The Temple of the Maleatean Apollo stood on Mount Kynortion much further to the south; the ruins are of so fragmentary a description that it is hardly possible from them to reconstruct the temple.

The Great Theatre (F), situated to the south of the precinct, was built about the year 450 B.C. by Polycleitus, the architect of the tholos. Pausanias, who was a

great traveller, tells us it was the most interesting of all the theatres existing in his time, and to-day anyone who is familiar with the theatres of Greece and the Greek colonies will say that this is more impressive than any of them. The Koilon or auditorium consisted of fifty-five rows of marble seats with twenty-four lines of stairs. The space for the chorus is, according to the ancient system, circular, and in the centre doubtless stood an altar of Bacchus. The stage was elevated nearly 12 feet, the proscenium being enriched by splendid sculpture. The acoustics of the theatre are perfect; a sound little louder than a whisper uttered on the stage can be heard in every part. The theatre is so placed on the slope of Kynortion that the occupants of the major part of the auditorium had a charming view (over the top of the stage) of the mountains to the north and of the whole range of beautiful buildings of the Hieron. While witnessing here the sublime tragedies of Æschylus or Sophocles, or such a comedy as *The Plutus* of Aristophanes (in which, as you will remember, great fun is made of Asklepios and his priests), the contrast afforded by glancing from the stage to the blues and purples of the mountains, the verdancy of the grove, and the beautiful forms and colours of the group of temples would be most pleasing. The Greeks were acute in perceiving and taking advances of subtle sources of pleasure like this, and I believe that the sites of many of their theatres were chosen so as to secure for the audience this double pleasure. The Theatre of Delphi is an example of this provision, as also in a less degree is that of Tauromena. This theatre has been said to seat 12,000 spectators; according to my own rough computation, it unquestionably will hold over 9,000 without crowding.

No. 16 represents certain Roman buildings external to the precincts, the object of which is undetermined.

No. 17 is probably the northern boundary of the precinct.

No. 18 represents a part of the southern boundary, the rest of the boundary line has not yet been ascertained.

No. 19. The Stadium. It is not certain yet which is the semicircular end; formerly it was supposed to be that adjoining the sanctuary, now it appears more likely to have been at the other extremity. As yet only a portion of it is excavated. It was over 600 feet long, and on either side were fifteen rows of marble seats; probably foot, horse, and chariot races took place here as well as other forms of athletic exercise.

Before saying anything about the ritual and the treatment of the sick at the Hieron, it will be well to turn to the Asklepeion at Athens, and examine briefly the structural arrangements there. Situated on the south side of the Acropolis, at an elevation of perhaps 80 feet above the plain, adjoining on the east the theatre of Dionysius, the locality was probably as healthy as any the immediate neighbourhood of Athens could supply. The buildings were to a certain extent an imitation, on a smaller scale, and on a limited area, of those at the Hieron of Epidaurus. Remains of what were probably a temple of Asklepios and Hygieia, of Doric architecture, also a supposed temple of Themis, and a shrine of Isis, exist, while smaller shrines of Serapis, Core, Hypnos, Herakles, Panaceaia, Demeter, and other divinities have left no distinct traces. There are considerable remains of a large Eastern portico or abaton of Pentellic marble, from which is reached a circular chamber in the rock containing the sacred well. Close to the abaton is a curious well-like structure, surrounded by marble columns, which perhaps was the serpent pit. A western portico or abaton also existed, and a grove containing great numbers of statues, busts, ex-votos, and inscriptions. The annexed outline sketch (p. 1512) may help in giving some general idea of the precinct. The theatre of Dionysius close at hand was doubtless frequented by the sick as a diversion. The stall occupied by the priest, with his name on, it is still in excellent preservation. The Panathenaic stadium, about half a mile away, doubtless was also frequently visited by the convalescents from the Asklepeion.

By the will of the late Dr. Elizabeth H. Bates, of Port Chester, N. Y., the University of Michigan will receive 125,000 dollars, the income from which is to be used in establishing a chair for the diseases of women and children, to be known as the Bates Professorship.

COMPLETE ATROPHY OF THE DELTOID WITH VICARIOUS RESTORATION OF FUNCTION.*

[WITH SPECIAL PLATE.]

By ROBERT KENNEDY, M.A., B.Sc., M.D.,
Dispensary Surgeon, Western Infirmary, Glasgow.

M. K., aged 22, presented himself at the dispensary of the Western Infirmary, Glasgow, on June 21st, 1897, complaining that after a hard day's work he experienced stiffness in his back and right shoulder.

On January 29th, 1895, he fell into the hold of a ship, and, on being admitted to the Western Infirmary, it was found that he had sustained a subcoracoid dislocation of the right shoulder-joint, together with a fracture of the radius of the right forearm. The dislocation was reduced on the day of his admission, and the forearm put in splints.

After removal of the splints he was unable to use his arm for about six months, and, although practising daily with dumb-bells, was unable to elevate his arm at the shoulder-joint to any appreciable degree for eleven months, at the end of which time he returned to his work. The improvement then steadily advanced, and now his range of movement and power at the shoulder-joint is such that only careful inspection detects any abnormality.

At present, and as shown in the accompanying illustration, his physique is good, the muscular system being well developed. With the arms hanging by the sides, it is easily seen that the right deltoid is greatly atrophied, the roundness of the shoulder having disappeared, and the acromion and coracoid processes and head of the humerus rendered prominent. Seen from behind, the outer half of the spine of the scapula is prominent from absence of the deltoid, and from the front there is a hollow below the outer half of the clavicle from absence of muscular tissue.

Despite this condition of the deltoid, the degree to which the right arm can be elevated is not much less than in the case of the left arm, and the movement is performed with apparently as much ease on the one side as on the other. In this position of the arm, however, the area of the deltoid shows no prominence corresponding to the contracted deltoid of the opposite side, but there is a well-marked prominence corresponding to the portion of the trapezius inserted into the angle between the clavicle and the spine of the scapula, a prominence which is entirely absent from the left side. Another point of difference between the two sides is the degree of rotation of the scapula when the arm is elevated, which is so marked on the right side that the inferior angle is carried in front of the lateral line. This rotation of the scapula is marked, when the patient is viewed from the front, by the axilla looking more in a forward direction than that of the opposite side.

His range of movement in the affected arm leaves little to be desired. He can place the right hand on the crown of his head and on the nape of his neck with as much ease as he can his left, and has quite as much power in performing these movements on the right as on the left side; indeed, using his right arm at his work more than the left, he performs these movements at the right shoulder-joint with greater precision and ease than in the case of the left. There are, however, some movements which he performs defectively. Thus he has difficulty in throwing a stone, and when he puts his hand in his trouser pocket he cannot withdraw it so easily as in the case of the other arm. The total absence of contractility in the right deltoid is demonstrated when the hand is placed over the muscle, and the patient directed to elevate the arm; for, while all the neighbouring muscles become tense and prominent, the region of the deltoid is found in precisely the same condition as it is when the arm is hanging by the side. The various bony prominences are felt as if covered only by skin and subcutaneous tissue. There is absolutely no response to electrical stimuli. There is also distinct atrophy of the muscular mass at the axillary border of the scapula, due doubtless to atrophy of the teres minor. On the other hand, on placing the hands over the cervical portions of the trapezii, and directing the patient to raise

* The paper was read and the patient shown at a meeting of the Glasgow Medico-Chirurgical Society.