for the males in this case are minute animals attached to the female, and often difficult of detection. In these complementary males, the entire organism is modified for sexual function; for, as Darwin describes it, there is no mouth, no stomach, no thorax, no abdomen, no appendages, no limbs of any kind, yet all these parts are represented in the female. It seems to be simply a bag of spermatozoa, furnished with a few muscles, an eye, the pupal antennae, and a probosciform penis, which, when uncoiled, is equal to eight or nine times the length of the animal. Darwin's observations have recently been confirmed by Professor Hoek's observations on the cirripeds collected by the *Challenger*.

Among mammals, the most striking examples of the peculiar value of hypertrophy must be mentioned, the curious malformed generative organs which occur in the cattle known as "free martins." Hunter carefully investigated the condition of the reproductive organs in these cases; and the valuable dissections he made, now in the Hunterian Museum, are striking monuments to his inquisitiveness in this matter. Careful comparison of the detailed descriptions of the dissections of these malformations, and similar cases of sheep and goats which have come under my observation, show most conclusively that in these cases we have to deal not with any one malformation common to all examples of free martins, but rather with instances in which both sets of organs have attempted to attain a functional condition, with the result that both have failed to reach it. In some of these cases, the Wolffian ducts have advanced many stages towards making a fairly complete set of efferent ducts for the testicles, and the calf approaches somewhat to a bull-calf. In other instances, the Müllerian ducts have made great progress, and a diminutive uterus can be made out, and in this case the calf most resembles a cow-calf. Between these two extremes, there is every gradation and variety. Similar cases occur in fishes, reptiles, amphibians, birds, etc. I have seen many cases, and numberless instances have been recorded out of curiosity.

These cases show most conclusively how impossible it is for both sets of reproductive organs to attain a functional condition in the same individual. Hypertrophy of one set must arise and establish pre-eminence over the other.

The facts on which the argument rests, that hypertrophy is one of the causes of division of sexes, may be summarised as follows.

1. In the lowest forms of animal life, hermaphroditism is the prevailing condition.
2. Cross-fertilisation in hemaphrodites is the rule, and may, as in some of the *myxotomida*, lead to a division into sexes within the limits of a single group.
3. Sporadic cases of adult hermaphroditism are far more common in the lowest forms of life.
4. If in mammals both sets of organs grow concurrently, the individual is sterile.
5. Both sets of organs grow equally to a definite period in embryonic life.
6. Reproduction of vertebrata, so far as is known, is impossible, unless hypertrophy of one set of organs occur.

Among other remarkable examples of the wonderful correlation which exists between hypertrophy and atrophy, must be mentioned the disappearance of gills in all forms above the ichthyopsida (fishes and amphibia). Balfour has pointed out that the allantois can be regarded in no other light than that of an enormously hypertrophied urinary bladder, which, having become a vascular sac, assumed the functions of respiration in the embryo. Hypertrophy of one organ, or set of organs, leads invariably to atrophy of some other organ. Before the work of embryonic respiration was performed by the allantois, many and various contrivances existed for the performance of this important function; for example, by means of external gills, the tail, and vascular adhesions of the yolk-sac; but, when once a functional allantois appears on the scene, all these methods are rendered obsolete, and gills for ever disappear.

It is to be hoped that the examples of what should be considered as hypertrophy, as compared with simple overgrowth, have been sufficiently convincing to impress upon my audience the importance of the distinction. Viewed in this light, hypertrophy shows itself to be a process of extreme beauty, utility, and interest, especially so when we reflect that the same process which enables one kidney to recompense the organism for the loss of its fellow, is only an instance of the method by which the tibia has outgrown the fibula. The disappearance of gills in all forms of vertebrates above ichthyopsida (fishes and batrachians) has been brought about by the allantois. The division of reproductive labour and the institution of sexes, and many other equally important results, are the effects of the indisputable correlation which exists between hypertrophy and atrophy.

Let us now proceed to consider certain examples of simple overgrowths which appear to have been transmitted so as at length to become race-characters. In no structure is this so admirably illustrated or so easily studied, as in the teeth of mammals. I have already referred to those instances of teeth which grow from persistent pulp, and, from lack of antagonism, occasionally exceed their normal dimensions many times, describe circles, re-enter their own pulp-chamber, or even penetrate the skull of their owner, and bring about death.

One of the most remarkable forms of dentition among mammals is that of the Babirussa. The extraordinary canines of this animal have afforded plenty of scope to imaginative minds to account for their strange mode of growth. These teeth grow from persistent pulps; and it may easily be conceived that, from some cause or other, the upper and lower canines failed to antagonise each other, and in consequence became enormously elongated. This abnormality frequently recurring, the peculiarity became transmitted to the offspring, eventually becoming perpetuated as a common feature in the males of this particular species. This isolated case does not carry much weight; but it must be remembered that, in all members of the pig-family—the common boar, the peccary, the wart hogs, the hippopotamus, as well as the babirussa—the canines have a great tendency to overgrowth, and to describe circles. Thus, in the wild boar, the upper canine is slightly curved; in the wart-hog, its curve is very extensive, and clears for some distance the upper lip; whilst, in the babirussa, the curve is so exaggerated as to pierce the upper lip. Hence the careful consideration of these facts forces me to the conclusion that these peculiar canines were brought about in the first instance as an example of overgrowth due to loss of antagonism, and the defect has been transmitted to the offspring. The remarkable teeth of mesoplodon, the narwhal, and other of the cetacea, are probably examples of the same process.

Lastly, when considering hypertrophy, it was shown that this process led to dwarfing of other organs associated with the enlarging organ, in that it led to diversion of the nutrient fluid. This is well shown in the teeth, for in all cases the teeth which are immediately adjacent to these overgrown examples are, as a rule, the smallest functional teeth possessed by the animal; and in very many cases they fall out early, and in some instances are suppressed whilst yet embryonic, and never appear above the gums.

A CASE WHERE LITHOTOMY WAS TWICE PERFORMED WITHIN FOURTEEN MONTHS: WITH REMARKS ON THE RECURRENCE OF STONE IN THE BLADDER.

Read before the Liverpool Medical Institution.

BY REGINALD HARRISON, F.R.C.S.,

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CASES of recurring stone in the bladder, requiring removal by lithotomy, are sufficiently rare as to need no apology for their narration. The particulars of this instance are as follows.

Thomas S., aged 62, was admitted into the Royal Infirmary in July, 1884. He had suffered from symptoms of stone for some months, and, on examination, it was found that he had more than one calculus in the bladder. The prostate was large, and impeded the easy introduction of the necessary instruments for sounding and exploring. Under these circumstances, I selected lithotomy, with the view not only of removing the stones, but of improving the prostatic urethra by the method I have already described ("On the Treatment of certain Cases of Prostatic Obstruction by a Section of the Gland," *Trans. International Medical Congress*, Copenhagen, 1884). On July 25th, 1884, I performed lateral lithotomy, and made a free section of the prostate, which, by the elevation of its floor from hypertrophy, rendered access to the bladder difficult. I removed two and a quarter ounces of stone, which broke in extraction; allowing for portions that were lost during this piece-meal removal, the stones must have weighed nearly three ounces. They were composed chiefly of phosphates, but with some urates. The bladder was then carefully explored, both with straight and curved forceps, and with the finger, and, finally, was well washed out with the pipe of a Higginson's syringe passed in through the wound. The section of the prostate referred to rendered these various manipulations quite easy. One of my bladder drainage-tubes was introduced. There was some free oozing after the operation, requiring a plug of lint soaked in turpentine to be inserted by the side of the tube. The

patient made a good recovery. The bladder-drainage-tube, which was retained for the purpose of rendering the section of the prostate permanent, was changed several times, but was not finally removed until six weeks after the operation. The patient left the infirmary shortly afterwards, apparently well, but with a sinus through which urine passed in small quantities. Considering the time the drainage-tube had been retained, I did not attach any importance to this; and, guided by other experiences, assured the patient that the wound would soon heal.

After leaving, though he returned to his work, his bladder never quite recovered itself; the wound did not entirely close, and he suffered more or less at times from cystitis. This led me to think the bladder was sacculated, but I could detect nothing more. In August, 1885, my house-surgeon, Dr. Bristow, sounded him, and thought he felt another stone. On a subsequent examination, I confirmed this diagnosis; and, on September 12th, 1885, I again performed lateral lithotomy for him on the old line, in the course of which there was a small sinus remaining from the previous operation. Surgeon-General Mackinnon, C.B., and Dr. Frank, of Cannes, were present. The operation was perfectly easy, the access to the bladder being greatly improved; for, on this occasion, the largest staff could be readily passed. I removed a stone, which, with its encrusting shell of friable phosphates, weighed one ounce. A double bladder-drainage-tube was inserted, and retained for a few days. The patient was up on the twenty-third day, and left the infirmary exactly five weeks after the operation, with the wound soundly healed, and all the functions of the bladder entirely restored. He has since reported himself as remaining quite well. There is now no prostatic bar nor residual urine.

I was somewhat puzzled at first to explain satisfactorily the course of events in this case. I have mentioned the various processes employed at the first operation, so far as improving the entrance into the bladder was concerned, for the purpose of showing how thorough an examination of the viscus was necessarily made, both by the finger and by different kinds of instruments. It seemed almost impossible that a stone, however sacculated, could, under these circumstances, have escaped detection. Still, on the other hand, considering that the wound never entirely closed after the first operation, and that, in the interval, the patient was never free from signs of vesical irritation, it seemed probable that the whole of the stone had not in the first instance been removed. A careful examination of a section of the stone itself further convinced me that this was the case. If the mass of calculous material removed at the second operation be carefully examined, it will be seen to consist, as geologists would say, of two different strata: the inner portion or nucleus, of the size of a flattened French prune, evidently belongs to the same period and formation as the calculi removed at the first operation; the outer friable crust of phosphate being of recent production. I have no hesitation in concluding that a stone, of considerable size, escaped detection and removal at the time of the first operation, even in spite of all the precautions which the state of the prostate prompted.

As I have now performed lithotomy close upon one hundred times, in children and adults, in about equal proportion, with a mortality of four or five per cent., I think I may plead that both experience and care proved unequal on this occasion in avoiding a contingency, which, had death happened after the first operation, might have exposed one less accustomed to operate for stone than myself to unjust obloquy and criticism. Hence my desire, apart from the general interest of the case, to record it.

One circumstance afforded me considerable satisfaction, and that was my being able to ascertain, beyond all reasonable doubt, how feasible it is permanently to improve the condition of the large prostate by its section, as already referred to, in cases uncomplicated with stone. One great objection I have urged against the suprapubic operation for stone is, that it prevents anything from being done to improve the condition of the large prostate, when this complication is present, and to obviate recurring symptoms, which may continue, though no stone is left to account for them. Mr. C. Williams, of Norwich, has recently published a case (BRITISH MEDICAL JOURNAL, June 15th, 1878, and November 14th, 1885), which adds importantly to our knowledge relative to operative procedures on the large prostate. It was an instance where he operated twice for stone, in a patient over seventy years of age. On the first occasion, the whole of the middle lobe of an enlarged prostate was removed, and, subsequently, another stone, by lateral lithotomy. Referring to what had previously been done, Mr. Williams remarks: "The next point is the condition of the floor of the bladder. Two years and a half had elapsed since the part was removed, and no further growth from the prostate had taken place. The wound made by such removal had healed, and the floor of the bladder was soft, even, and natural."

Reverting to my own case: in the improved state of the outlet from the bladder may be found the explanation as to how it happened that the sacculus or depression, which concealed the stone and rendered a second operation necessary, got rid of its occupant, and led to the bladder again resuming its normal shape and function. I do not think there can be any doubt that, of the various causes which bring about sacculations and changes in the shape of the bladder, anything which permanently obstructs micturition is the most fertile; and, in the recognition of this explanation, we have the best indication for the correction of this lesion. The case I have narrated serves to illustrate this point. It may be doubted whether a bladder is capable of becoming so completely sacculated as to conceal a large stone from detection. One of the best specimens, illustrating the possibility of this, I casually met with in the Museum of Queen's College, Birmingham, on a recent visit.

As to the frequency of relapses in cases of stone, Mr. Williams states, in reference to the practice at the Norwich Hospital ("The Relapse of Stone after Lithotomy," *Lancet*, May 18th, 1878): "This makes a total of 28 relapses in 1,015 operations (lithotrities and operations on females included), between 1772 and 1869, a period of ninety-seven years; and gives a proportion of one in 36, or, in 935 lithotomies (lateral and median), one in 33. All the patients were males, no instance of recurrence having shown itself in the female. In one case, a sacculated calculus was left undetected in the bladder, and removed with a loose one at a second operation." The case referred to in the last paragraph seems similar to the one I have related.

In connection with Mr. Williams's statistics relative to relapses of stone, it must be remembered that they are drawn from a locality where calculous disorders may be said to be endemic; consequently, if a larger area be taken, we may conclude that the proportion of recurrences is still less—a conclusion which my own experience would warrant. Amongst the causes favouring the reproduction of stone, I believe the large prostate is a very common one; and it seems to bring this about, so far as my observation has gone, in two ways. In the first place, persons who may have been in the habit of voiding for a considerable number of years renal calculi, find, after a certain age has been attained, that they cease doing so, and continued vesical irritation follows the attack of renal colic. The explanation lies in the fact that their prostates have enlarged; and thus stones, which previously escaped spontaneously, become practically trapped. I frequently remove from the bladder, by crushing, small uric acid calculi formed under these circumstances. In the second place, the large prostate, by permanently altering the shape of the outlet from the bladder, and thus causing urine to be constantly retained, engenders a state of continued cystitis and of excessive mucous secretion, which are the invariable preliminaries to the formation of phosphatic stones. In these directions may be often found explanations for the recurrence of stone in instances where there cannot be the least doubt that the primary formations had, on a previous occasion, been completely removed, either by lithotomy or by lithotripsy.

ON REPEATED LITHOTOMY.

By DONALD D. DAY, B.S., F.R.C.S.,
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THIS subject has already been discussed by Crosse in his Jacksonian essay on Urinary Calculus, and by C. Williams in a contribution to Holmes' *System of Surgery*, but in neither case has it been thoroughly exhausted. About a year ago, a celebrated operator stated that he had done his last case of lateral lithotomy; and, now that the operation is threatened with extinction, on the one hand by Bigelow's plan of crushing, with immediate extraction, and, on the other, by Petersen's method of the suprapubic operation, it seems desirable to weigh well its merits and demerits.

The question of mortality has been fully gone into by many writers. I now propose to discuss the liability to recurrence of stone afterwards, and to attempt to define its causes. By the kind permission of Mr. T. W. Crosse, curator of the museum of the Norfolk and Norwich Hospital, I have been enabled to compile the annexed table, giving a complete list of all the cases which have occurred in the hospital up to Christmas 1884, giving the museum-catalogue reference in each case. That this method is imperfect I am well aware, as it represents the statistics, not of those who suffered from a recurrence of stone, but of those who could summon up courage to face the operation again, which, in the pre-anæsthetic days, was no light matter. That some of these cases did again have stone without